MARCH, 1953 — FIFTY-NINTH YEAR

MACHINERY

NORMA-HOFFMANN

Roller Bearings

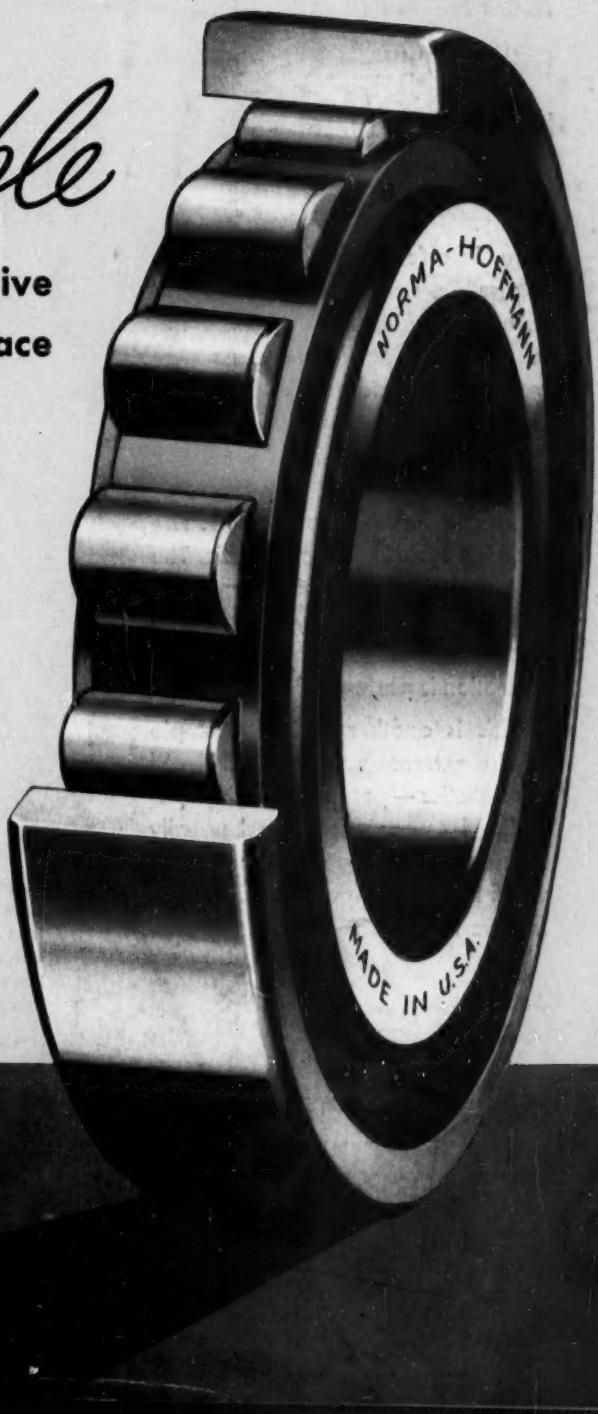
Interchangeable

with Single-Row Ball Bearings give maximum capacity in minimum space

Full line contact of rolling surfaces provides far greater radial load capacity than ball bearings and ability to absorb vibration, overload and shock. Use these bearings for high or low speeds.

NORMA-HOFFMANN BEARINGS CORP.
STAMFORD, CONN.

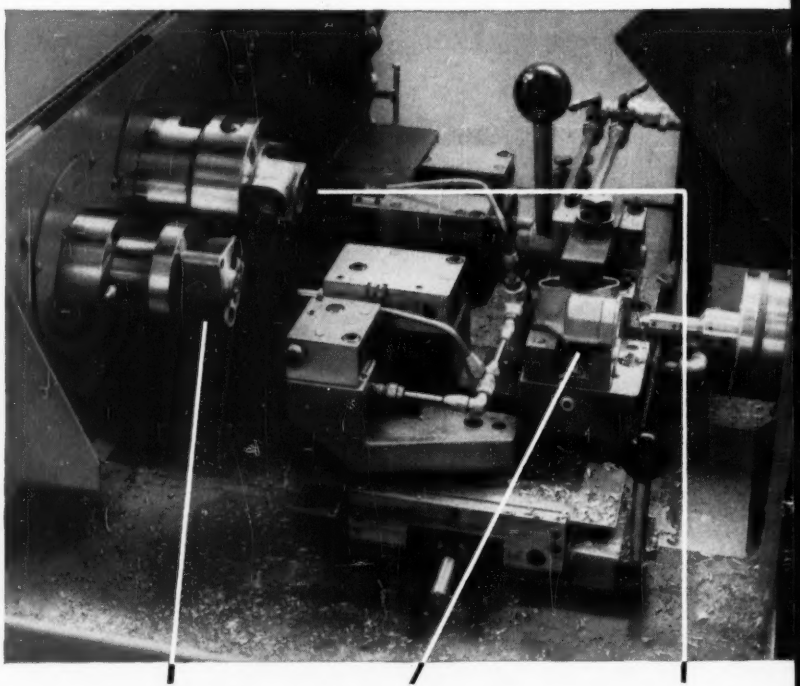
FIELD OFFICES: Atlanta, Birmingham, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Jacksonville, Kansas City, Los Angeles, San Francisco, Seattle



PROGRESSIVE BORIZING

speeds precision finishing of complex, multi-surface work

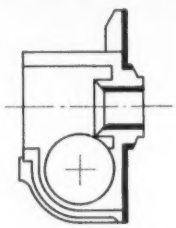
Heald Model 221 Bore-Matic finishes 9 different surfaces in 3 sequential operations



Here, in effect, are three machines in one—a single, versatile Heald Bore-Matic with three different fixture stations each having its own workholding and tooling features. The parts—precision instrument housings—are bored, faced and turned on 9 different surfaces in three consecutive operations. The machine cycle is fully automatic. The first and third operations are performed simultaneously on the left hand end of the machine; the second operation is performed on right end.

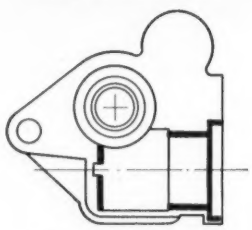
This is another typical example of the extreme versatility of Heald Bore-Matics—permitting highly specialized operations on a basically standard machine. Remember—when it comes to precision finishing, it pays to come to Heald.

1st OPERATION



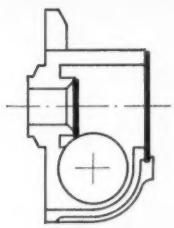
Rotating stake fixture holds the part on the left front station. Tooling on cross slide performs the boring, turning and facing operations indicated above.

2nd OPERATION



Part is clamped on platen type fixture on cross slide. Rotating tools on right-hand boringhead perform the two boring and two facing operations indicated.

3rd OPERATION



Rotating finger fixture on left rear boringhead holds work. Tooling mounted on cross slide performs the final two facing operations as indicated above.

HEALD

Case Study
No. 2230-96 in
PRECISION PRODUCTION

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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MACHINERY

VOLUME 59 **MARCH, 1953** NUMBER 7

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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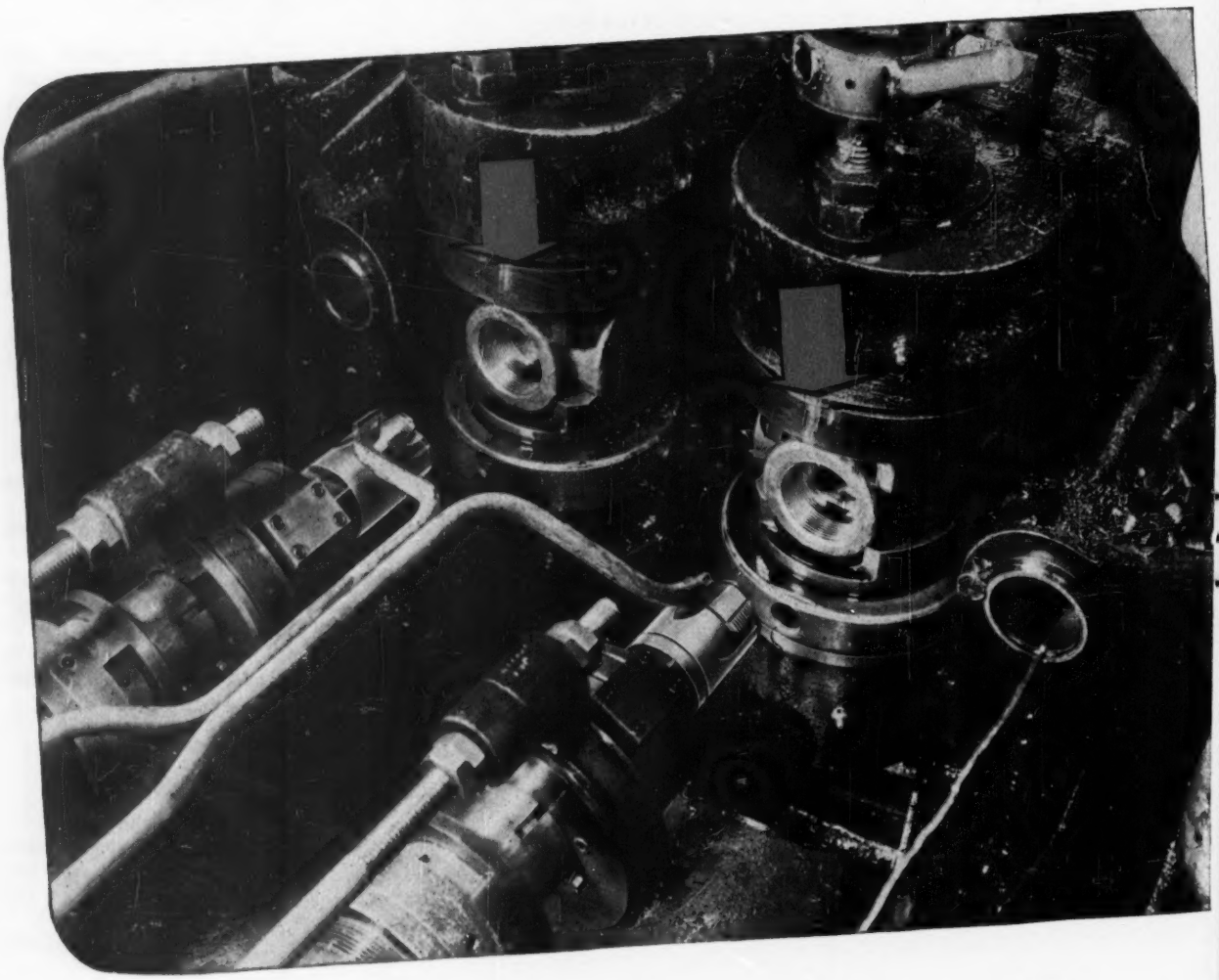
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LANDIS



The LANDIS Machine CO.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD

33HC

TAP

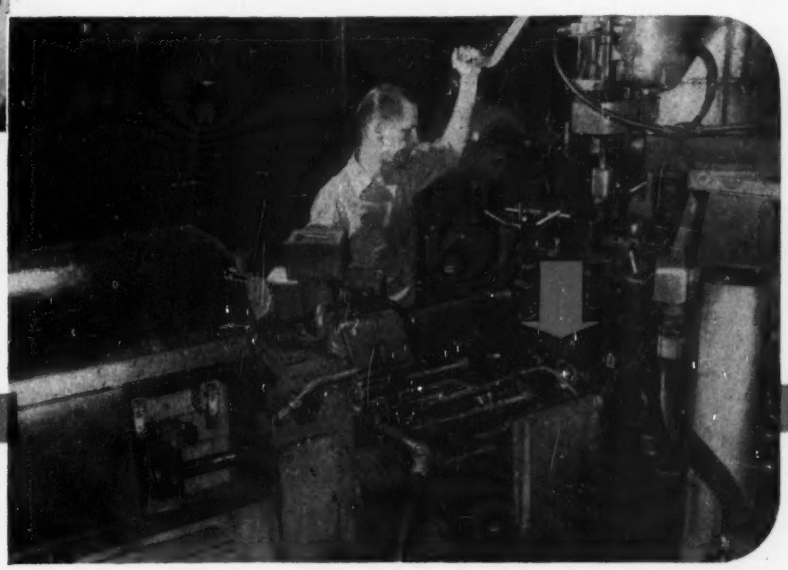
MASS-PRODUCES THREADS RATED FOR 6,000 POUNDS PRESSURE ! !

W-S forged steel pipe fittings guarantee the uninterrupted flow upon which the economy and safety of modern service and process piping lines depend. LANDIS Taps are regularly used by the Watson-Stillman Fittings Division, H. K. Porter Company, Inc., of Roselle, N. J., to cut the precision threads in these fittings required to withstand high pressures without leak.

In the illustrations, LANDIS LL Rotary Taps on a special drilling and tapping machine are threading W-S 2" 90° Pipe Elbows. 2" 11½ pitch ASTP threads are tapped in steel forgings at the rate of 35 surface feet per minute. Even at this speed 4000 threads are completed between chaser grinds, holding tool cost and downtime to a minimum.

LANDIS LL Taps are designed for the high-speed production of precision tapered threads. The taper of the threads is mechanically controlled by the receding action of the chasers. Cutting strains are thereby reduced, thread accuracy and finish improved, and chaser life lengthened. The design of the ALM Head features unevenly spaced chasers which provide maximum rigidity and prevent chatter.

Detachable heads allow each size of Tap to produce a wide range of thread diameters. For example, the 2" LL Tap with different size heads will cut pipe threads from 1" to 2½". Both Rotary and Stationary models are built in sizes up to 13⅜". For further information, send specifications and ask for Bulletin G-95.

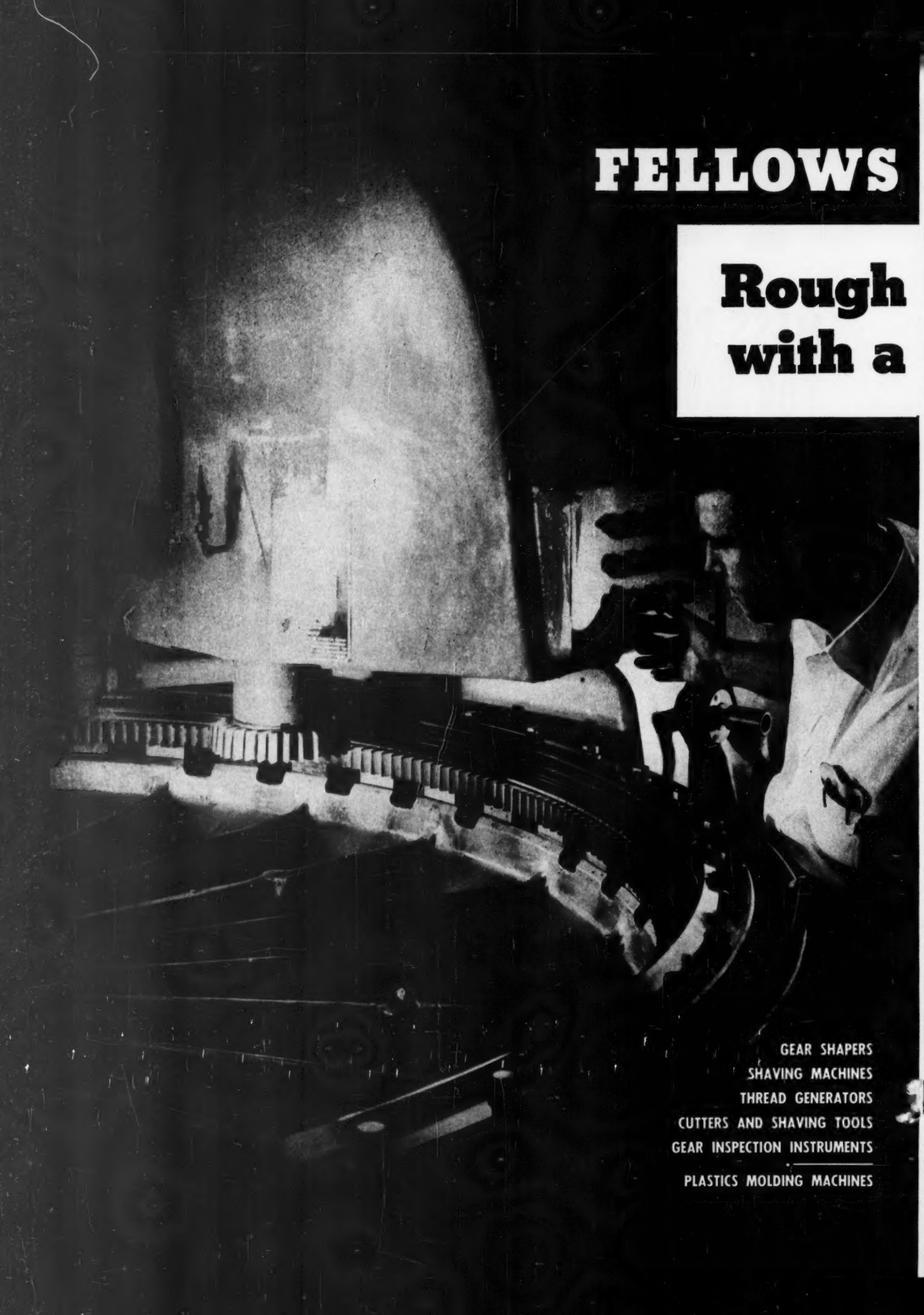


50TH ANNIVERSARY

WAYNESBORO PENNSYLVANIA

GENERATING EQUIPMENT

331-C


FELLOWS
Rough with a
GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

120" GEAR SHAPERS

and Finish Single Set-up!



Giant tank turret gears being accurately generated on Fellows 120" Gear Shapers at the Chrysler Delaware Tank Plant.



These gears are roughed and finished in two cuts at one setting of the work. Easily accessible fixtures, rigidly supported, reduce handling time and permit the use of increased cutting feeds to speed production. Tool maintenance costs are low because the cutters can be sharpened on any standard rotary surface grinder.

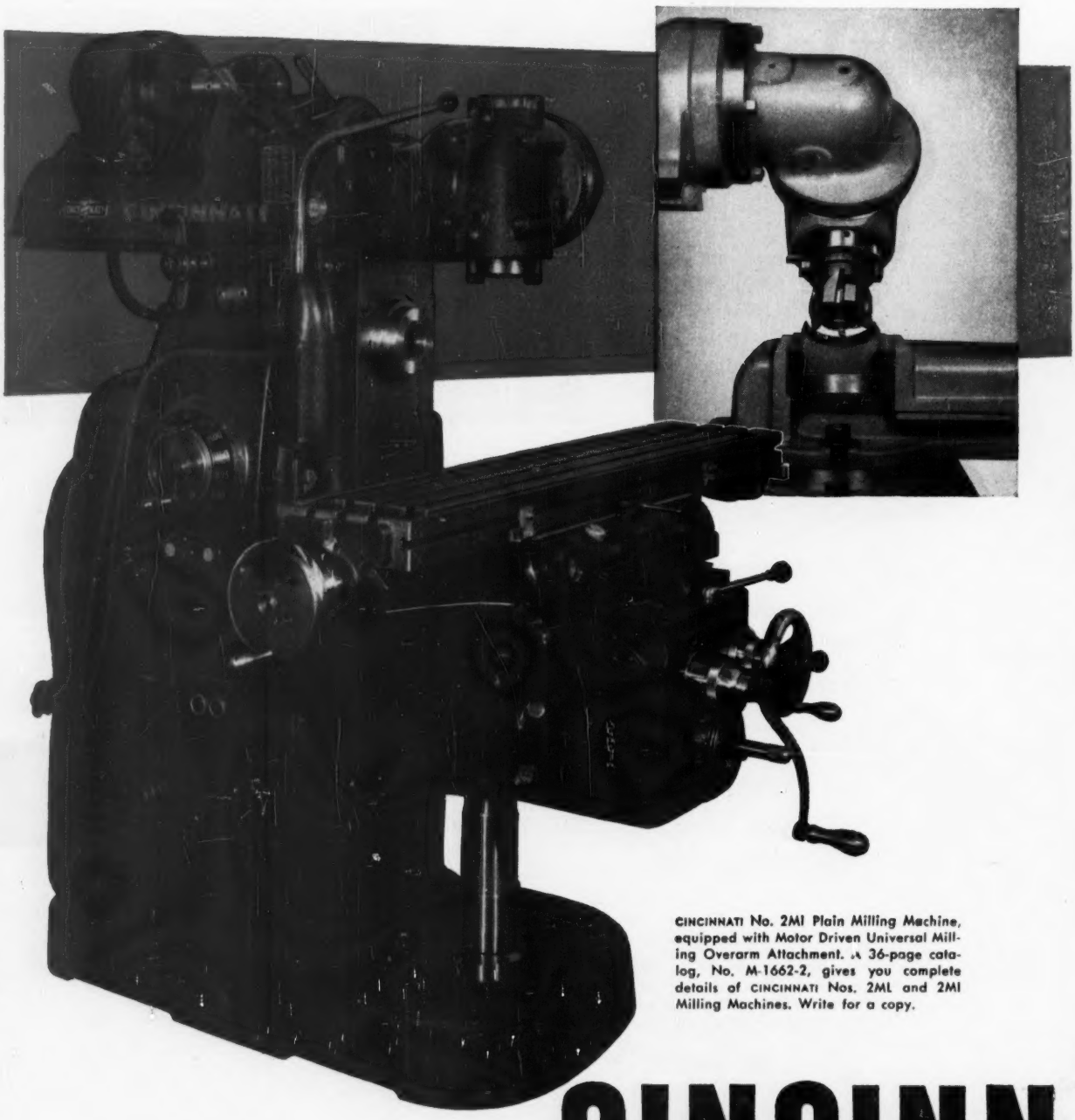
For speed and fine finish at the lowest practicable cost on either intermediate or larger gears, investigate the Fellows 36-Type, 48-Inch, or 100-Inch Gear Shapers. Write or call the Fellows office nearest you.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

Increasing the job

with Cincinnati Motor Driven

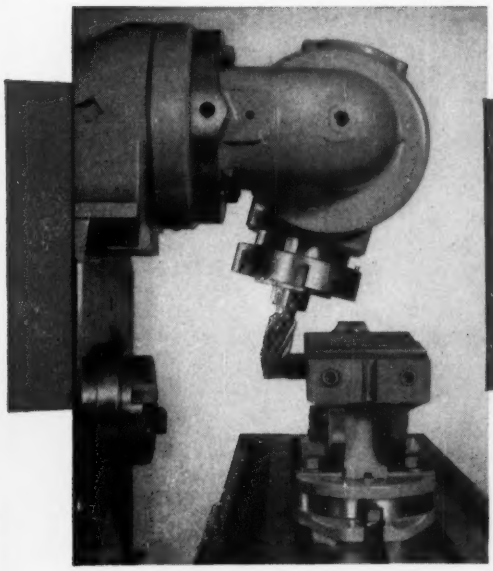


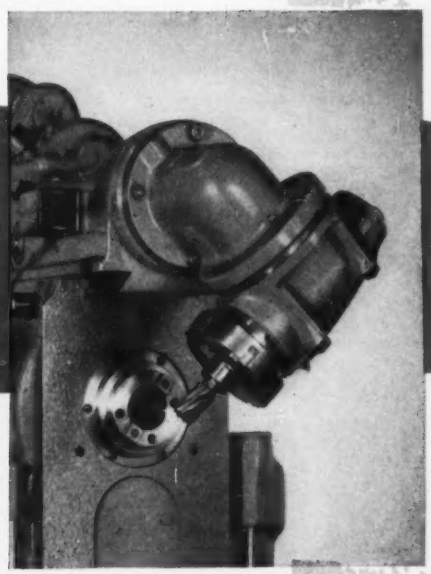
CINCINNATI No. 2MI Plain Milling Machine, equipped with Motor Driven Universal Milling Overarm Attachment. A 36-page catalog, No. M-1662-2, gives you complete details of CINCINNATI Nos. 2ML and 2MI Milling Machines. Write for a copy.

CINCINN

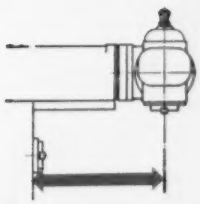
possibilities

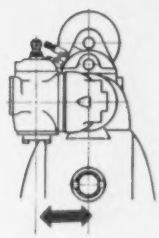
Overarm Attachment

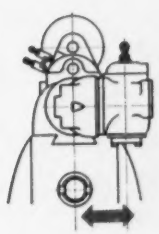


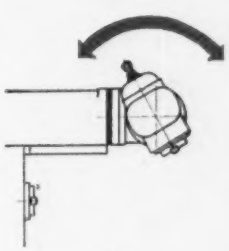


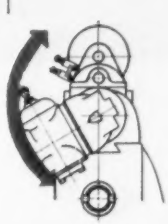
These drawings and photographs illustrate how CINCINNATI Motor Driven Universal Milling Overarm Attachments increase the range and versatility of CINCINNATI knee-type milling machines. Complete information in publication No. M-1661-1.











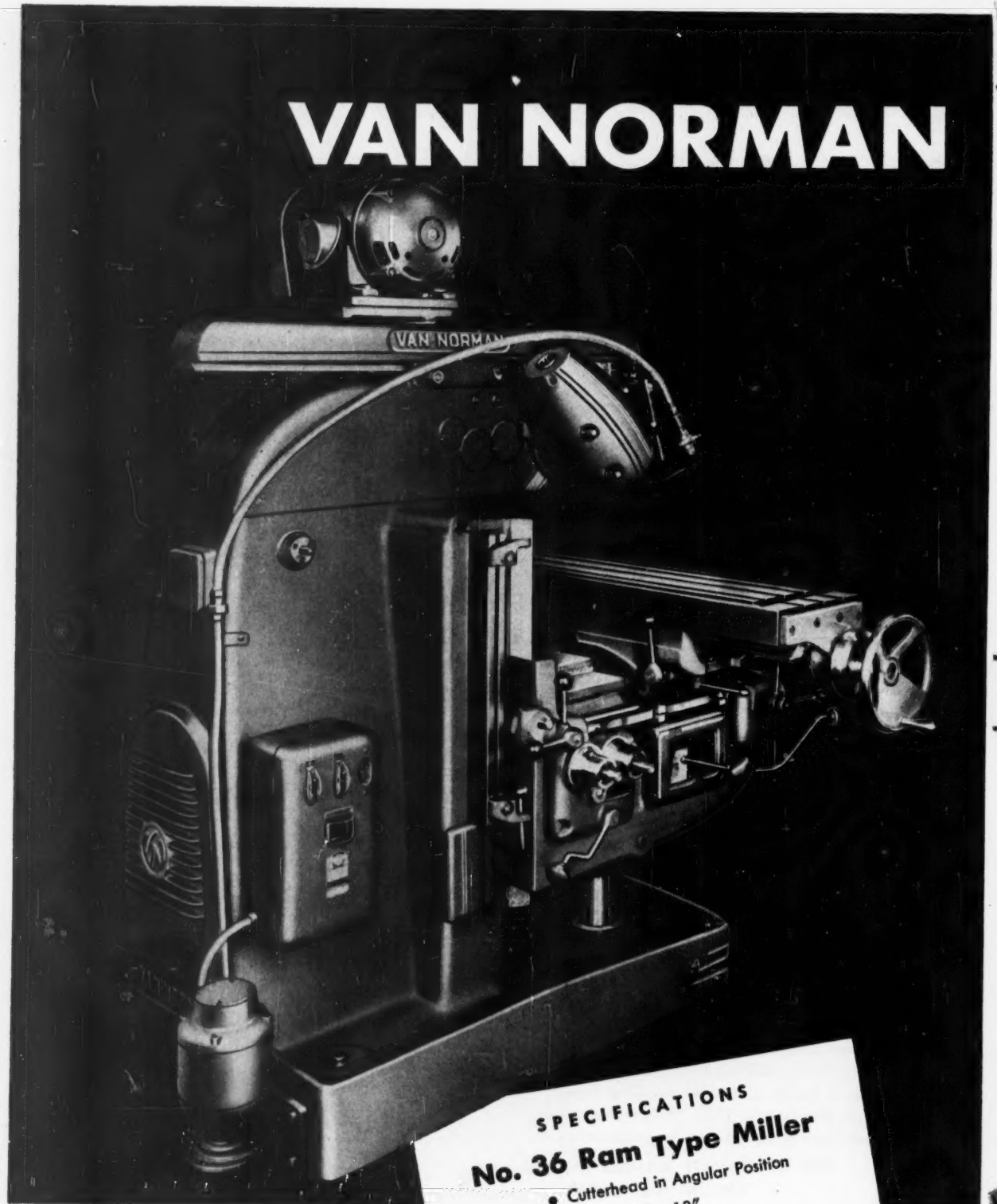
How many times have you needed a little extra range or extra versatility for a milling setup? Just think how much it would have saved! You can get all the extra range and versatility you will need on your CINCINNATI knee-type milling machines by equipping them with Motor Driven Overarm Attachments. ¶ Consider the CINCINNATI No. 2MI, for example. Of itself, it offers a host of advantages: convenient and easy speed change with one lever . . . a similar feature at the front of the knee for feed changes . . . 16 spindle speeds, 60 to 1 ratio . . . 16 feeds, 120 to 1 ratio . . . unit construction for low-cost maintenance. To these advantages and many others, add the extra range and versatility offered by the Motor Driven Overarm Attachment, and you have a toolroom miller that can handle any job. ¶ A few examples of the ways in which these self-contained attachments increase the job possibilities of CINCINNATI Milling Machines are illustrated here. There are two sizes, 2 hp for 2ML, 2MI and Dial Types; 5 hp for Dial Types and High Power and Dual Power Dial Types. You may obtain more information by writing for publication No. M-1661-1.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

ATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

VAN NORMAN



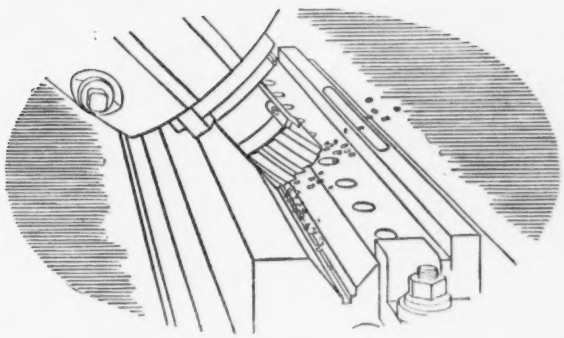
SPECIFICATIONS

No. 36 Ram Type Miller

- Cutterhead in Angular Position
- Table: 58″ x 13″
- 18 Speeds: 30 to 1500
- 18 Feeds: ⅜ to 32

Ram-Type Millers

TAKE A
GOOD CUT
in Milling Production Costs!



Adjustable Cutterhead Plus Movable Ram, Saddle Cross and Knee Vertical Feeds Increase Work Range • Reduce Costs

Van Norman Ram Type Millers embody many outstanding features which provide for faster, more economical milling in the tool room, pattern shop, die and mold shop, experimental laboratory and production line.

The combined adjustments of the cutterhead and ram movement permits conventional horizontal, vertical as well as angular milling on one machine. With Van Norman Millers, most non-productive time is eliminated, production is increased, while costs are reduced.

EASY TO OPERATE . . . Front and Rear control of operation (all millers from 22L and up) power and manual feeds, six-way rapid traverse.

WIDE RANGE OF USE . . . Adjustable Cutterhead — 90° adjustment from horizontal to vertical.

POWER AND RIGIDITY . . . Heavy-duty heat treated gear transmissions; massive cutterhead and ram; rugged column; large knee, saddle and table assemblies.

LONG LIFE . . . Automatic lubrication; antifriction bearings, multi-splined shafts. Large diameter feed screws.

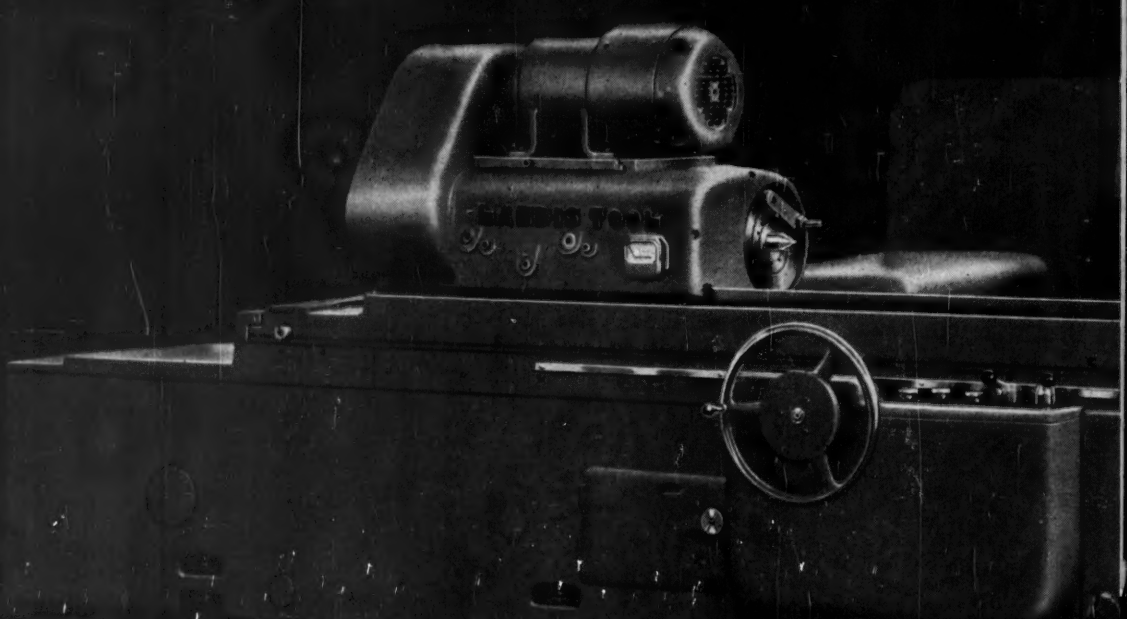
Investigate Van Norman Ram Type Millers. There's a size available to meet your particular requirements. Write for information

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS, U. S. A.

Heavy Cuts to Close Tolerances Shorten Grinding Cycle on Big Jobs

Exclusive Landis Features increase output without sacrifice of accuracy or finish

- Microsphere Spindle Bearing
- Reinforced Wheel Spindle



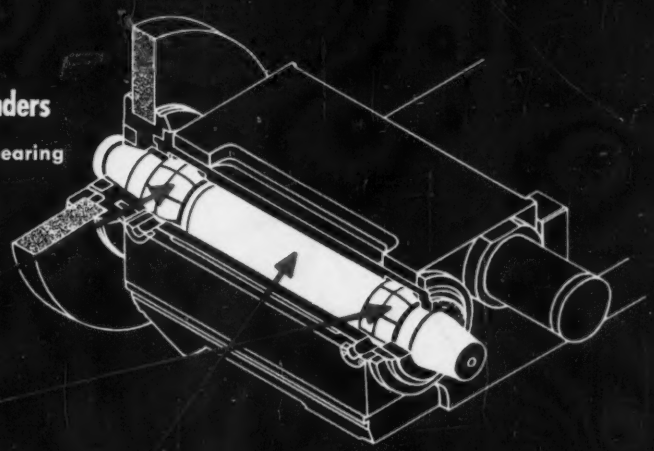
LANDIS Type F Series

Plain Grinders. Write for Catalog F-48.

LANDIS TOOL COMPANY, WAYNESBORO, PENNA., U.S.A.

Here's why you can take heavy cuts — grind fast with Landis type F series grinders

Cross section of wheelbase shows microsphere bearing and spindle assembly.



Microsphere Bearings

Close Clearance, Fast Grinding Cycle

Exceptionally close running clearance gives fast spark-out. Responds quickly and accurately to changes in wheel feed.

Reinforced Wheel Spindle

Extra Stiffness for Heavy Cuts

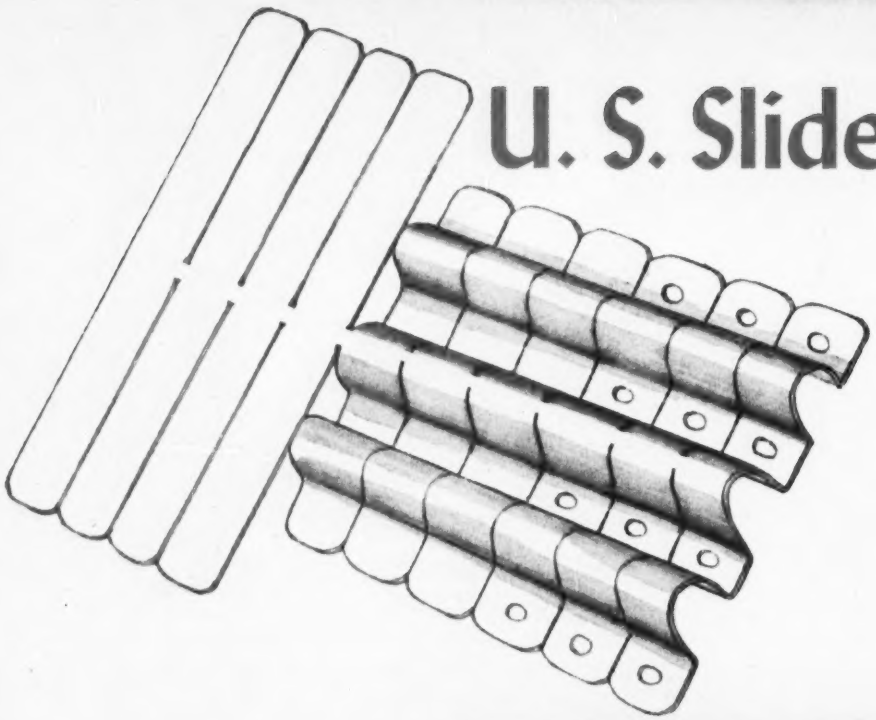
Increased diameter between bearings gives needed spindle rigidity for close tolerances and fine finishes.

159

LANDIS

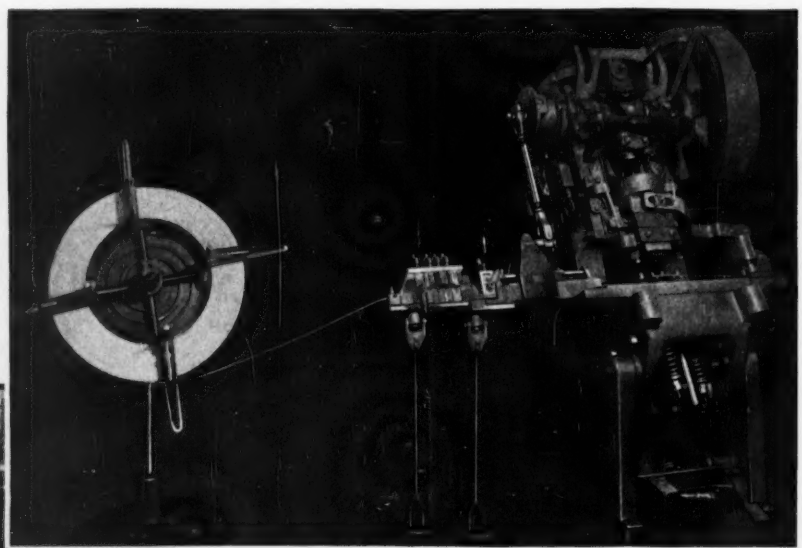
precision grinders





U. S. Slide Feeds on

The photos at the right and below illustrate the use of U. S. Slide Feeds equipped with U. S. Plain Straighteners on standard type open-back presses. This setup converts the press into an automatic machine; all the operator has to do is to start a new coil of material into the die after the previous coil has been run off. To make the setup complete, U. S. Stock Reels are employed in both instances for holding the coils of material.

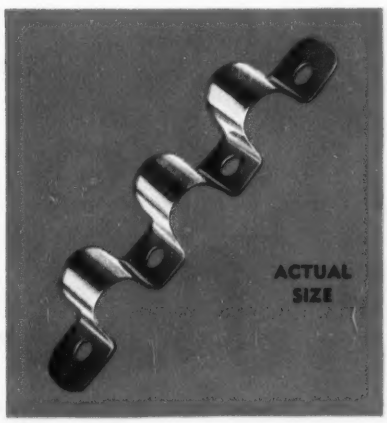




PRODUCTS

U.S. TOOL

Prove Their Accuracy Progressive Die Operations



Closely controlled accuracy with U. S. Slide Feeds—not just a statement, but a proven fact, as illustrated by the progressive die job being run by Judson & Rose, Inc., 3112 North 17th Street, Philadelphia 32, Pennsylvania.

The sketch on the facing page shows the progressive die operations, and the finished piece is shown actual size at the left. On this job there are no stops or pilots in the die. Accuracy of feed length is controlled by the U. S. Slide Feed to closer than .001". This example of U. S. Slide Feed accuracy is not exceptional. It is typical of results which are being obtained by other users of U. S. Slide Feeds.

If you have a press job which demands an accurate feed, we suggest that you investigate U. S. Slide Feeds. They are made in a range of sizes to accommodate stock up to 20" in width and with feed length adjustable up to a maximum of 20". Bulletin No. 80-M contains complete specifications of U. S. Stock Straighteners, U. S. Stock Reels and U. S. Coil Cradles. Ask for a copy.

COMPANY, Inc. AMPERE (East Orange) NEW JERSEY
Builders of U S Multi-Slides–U S Multi-Millers
U S Automatic Press Room Equipment–U S Die Sets and Accessories

5 MINUTES PER VERSATILE NEW CH

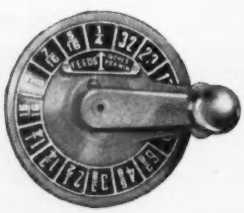
KEARNEY & TRECKER MILWAUKEE

Speeds fabrication of aircraft parts from 75ST aluminum alloy

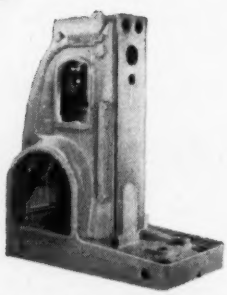
CH MILLING MACHINE FEATURES THAT HELPED INCREASE OUTPUT — CUT COST PER PIECE



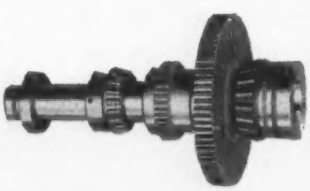
Speed range — *16* speed changes are provided from *25* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.



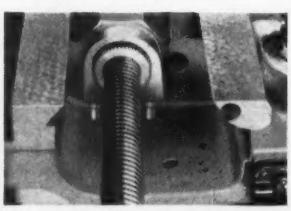
Extra-wide feed range — *16* feeds from *¼"* to *32"* per minute meet requirements of new metals and cutting tools for most efficient operation.



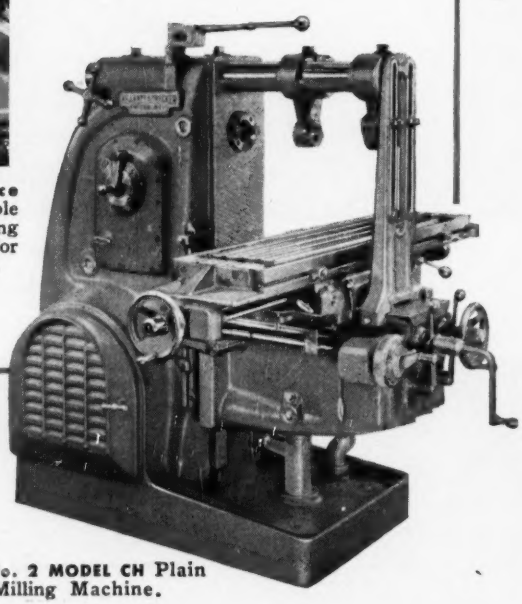
Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.



Greater cutting efficiency design refinements in 3-bearing spindle and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed.



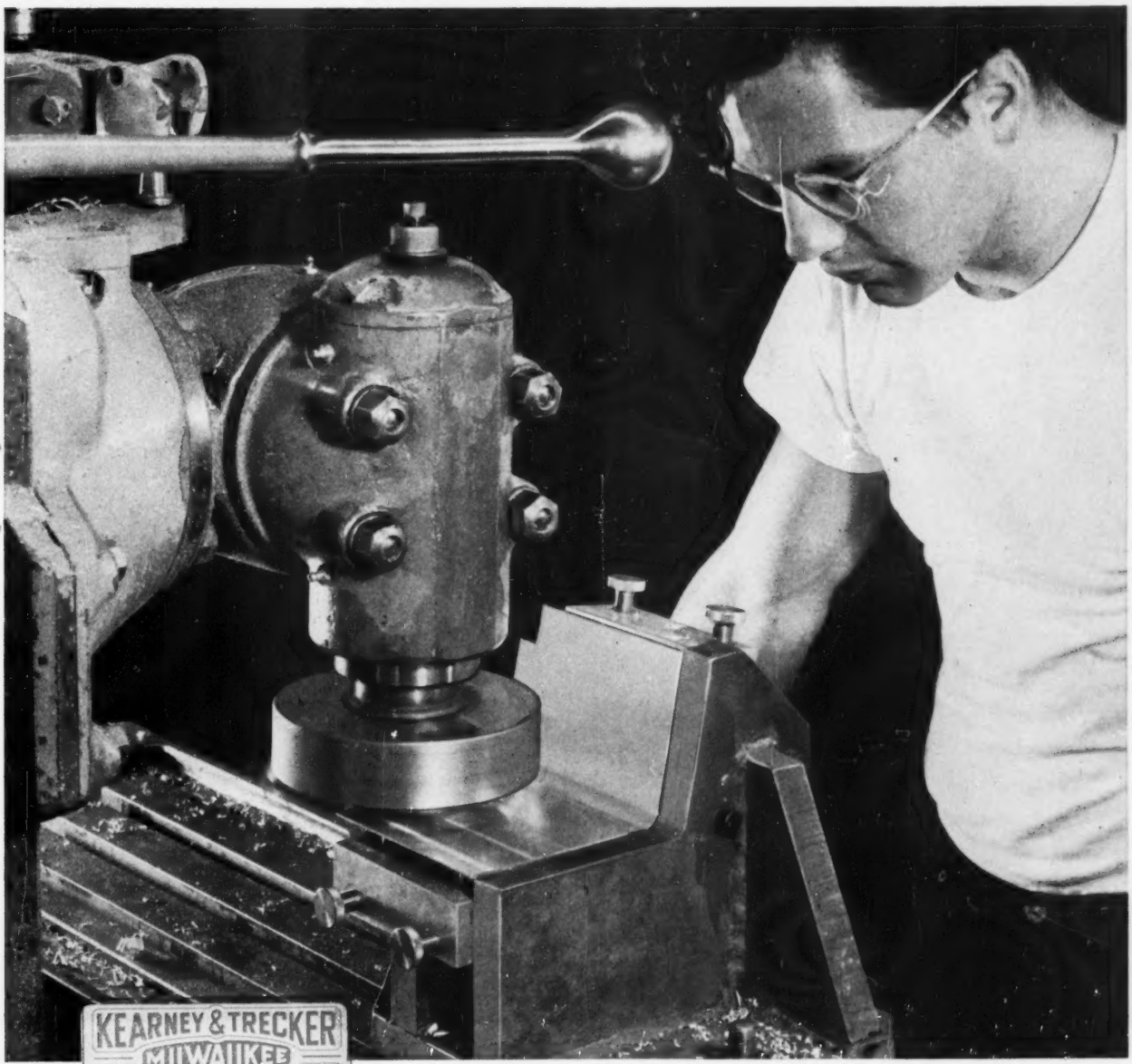
Smoother feed performance through a heavy duty 2" dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.



5 hp No. 2 MODEL CH Plain Style Milling Machine.

INVESTIGATE the versatile new CH line of milling machines. Their features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

PIECE WITH THIS MILLING MACHINE



KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

HERE ARE THE FACTS ON THIS JOB:

Location: - - - - Mar Vista Engineering Co., Los Angeles, Calif.

Machine: - No. 2, Model CH, 5 hp, Plain Style, used with Universal Milling Attachment.

Part: - - Aircraft fitting for horizontal stabilizer.

Material: - - - - - - 75ST aluminum alloy.

Cutter: - - - - One blade — 8" fly blade.

Cutter Speed: - - - - - 875 rpm, 9 ipm feed.

Depth of Cut: - - - - - - - - - .050".

Production: - 12 pieces per hour — all sides milled.

No "Special Problems" Any More . . .

MORSE *Special Purpose* DRILLS



MORSE

with these



Take another good look at that range of applications for the 5 types of drills listed above. Now what's so tough about any "special job", when you can get all these Morse Special-Purpose Drills . . . and others besides . . . from your Morse-Franchised Distributor *right now?*

Call him in today, and ask him what he recommends for that job of *yours*. He has the stock, the know-how . . . and the full backing of Morse engineers . . . to trim your "unusual" drilling problems down to size, both in performance and costs. *It's your move . . . and you can't lose!*

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASS.
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

WINTER TAPS HAVE

BALANCED Action





They are consistently accurate hole tappers. They have a long useful life. To appreciate them, note below what BALANCED ACTION means—then put them to work for you.

ALWAYS AT YOUR SERVICE

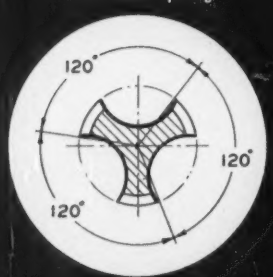
Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.

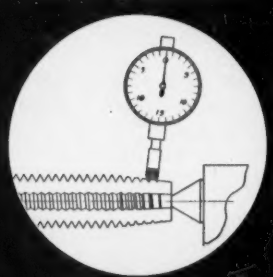


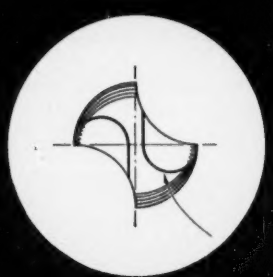
Exact Flute Spacing

Accurate and Concentric Chamfers





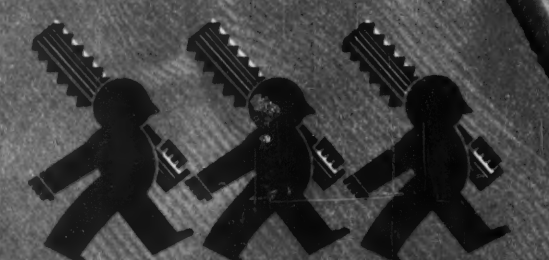


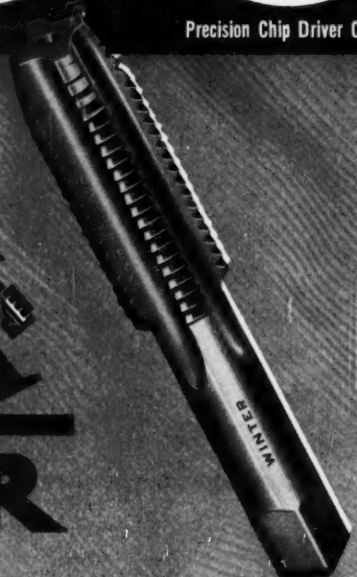


Uniform Flute Contours

Precision Chip Driver Contours







WINTER

WINTER BROTHERS COMPANY

Rochester, Michigan, U. S. A. Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco. Division of National Twist Drill & Tool Co.

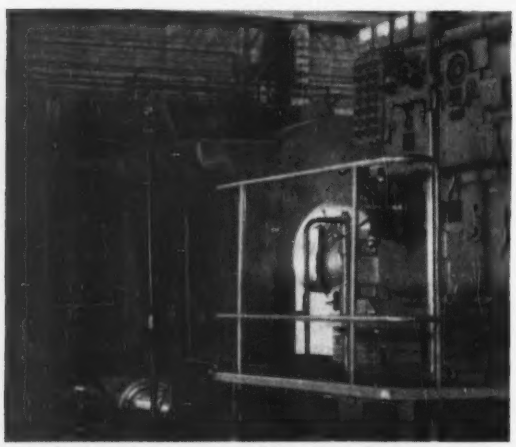

NATIONAL
TWIST DRILL
& TOOL
ROCHESTER, MICH., U.S.A.
National
LONG-WEARING
CUTTING EDGES
NATIONAL REAMERS perform for you at top efficiency in a wide variety of materials. Choose from the types shown here, or from many other types designed for specific uses . . . At cutting your costs—National has the edge!
NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U. S. A. Distributors in principal cities.
Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco.
CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR
. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.

Here's extra capacity for huge,

Now, throughout the G&L 50 Series' wide work range, you can accurately bore, mill or face up to 60" from the headstock . . . parallel or at right angles to the spindle

G&L 50 Series Horizontal Boring, Drilling and Milling Machines, with their open construction, are already well-known for their *extra-big-work* capacity. Now, they can be built with a new underarm support which provides hitherto impossible rigidity for heavy-duty milling, facing, boring and shaping tools *at distances to 60 inches* from the headstock face.

Six standard model tools can be easily mounted on the underarm: 46" face plate drive, 48" continuous feed facing head, 90° angular milling attachment, 90° offset milling attachment, spindle support and shaping attachment.



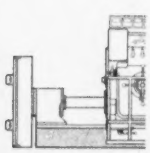
Boring head in operation on a difficult interrupted cut inside a large combination fabricated and cast housing.

Simplifies 75- to 125-ton jobs

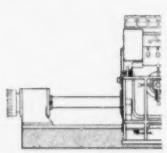
This new development gives you the flexibility necessary to keep costs in line on both routine or difficult 75- to 125-ton jobs. By increasing the number of operations you can perform without resetting the workpiece, it greatly reduces handling, setup and labor costs.

If you'd like to know how G&L machines can improve your shop's work capacity . . . give you increased production at far lower cost — contact your nearest G&L representative or write direct. BUT DON'T DELAY . . . DELIVERY ON G&L MACHINES MAY BE SOONER THAN YOU THINK!

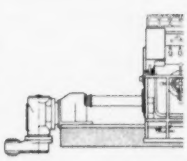
TYPICAL WAYS YOU CAN USE UNDERARM



Underarm extended spindle support with continuous feed facing head.



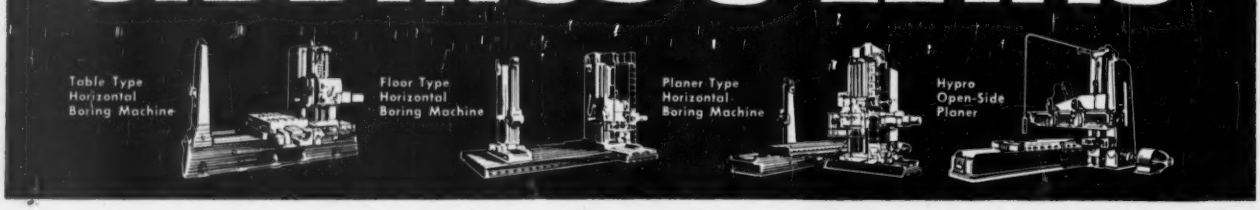
Underarm extended spindle support with face mill.



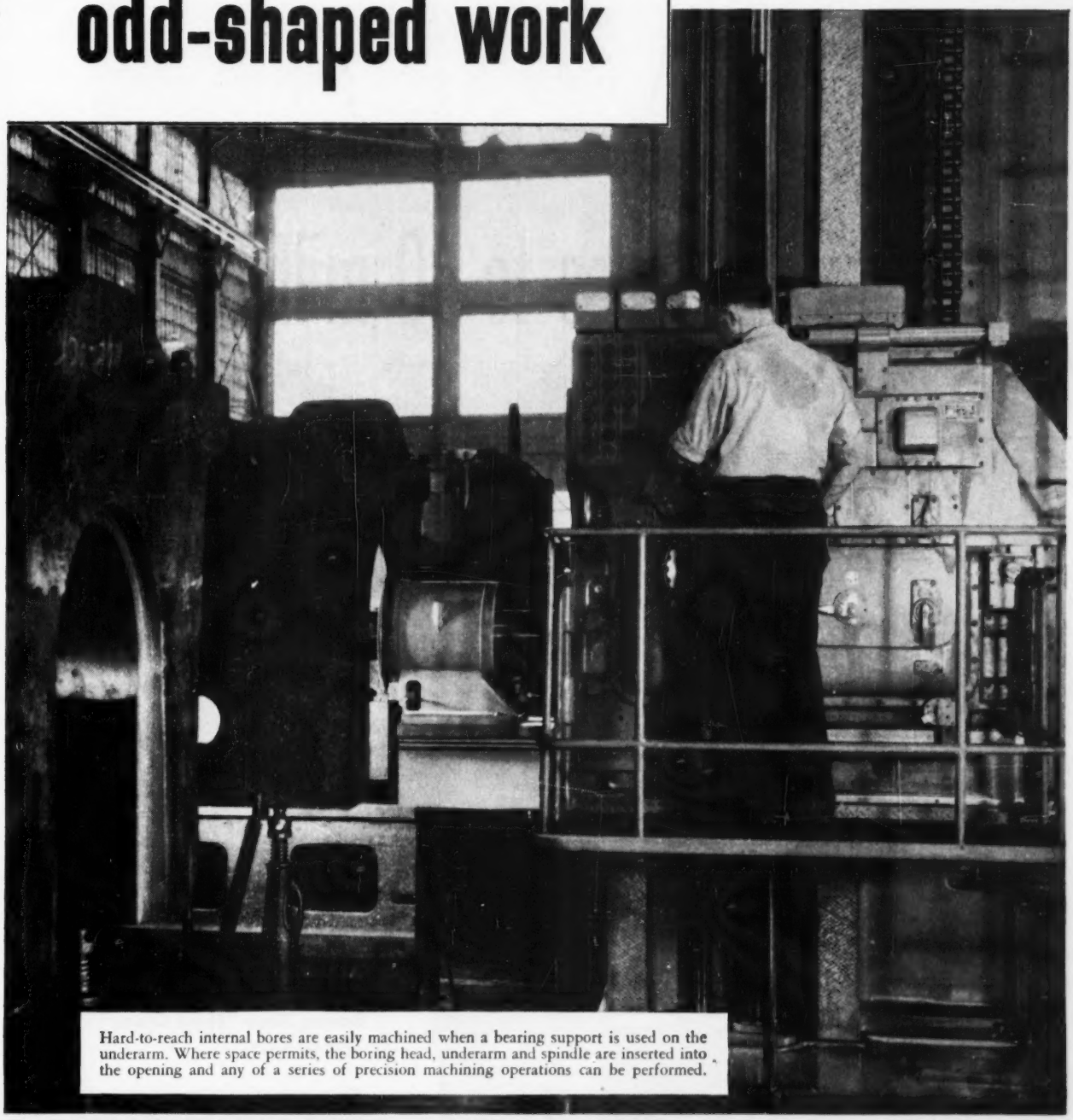
Underarm right angle swivel milling attachment with offset attachment.

G-24

GIDDINGS & LEWIS



odd-shaped work

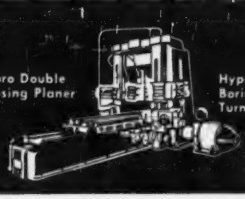


Hard-to-reach internal bores are easily machined when a bearing support is used on the underarm. Where space permits, the boring head, underarm and spindle are inserted into the opening and any of a series of precision machining operations can be performed.

MACHINE TOOL CO.



Hypro Planer Type Milling Machine



Hypro Double Housing Planer



Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN



Here's another reason it pays to get a proposal from Fosdick

We check flatness to 40 millionths

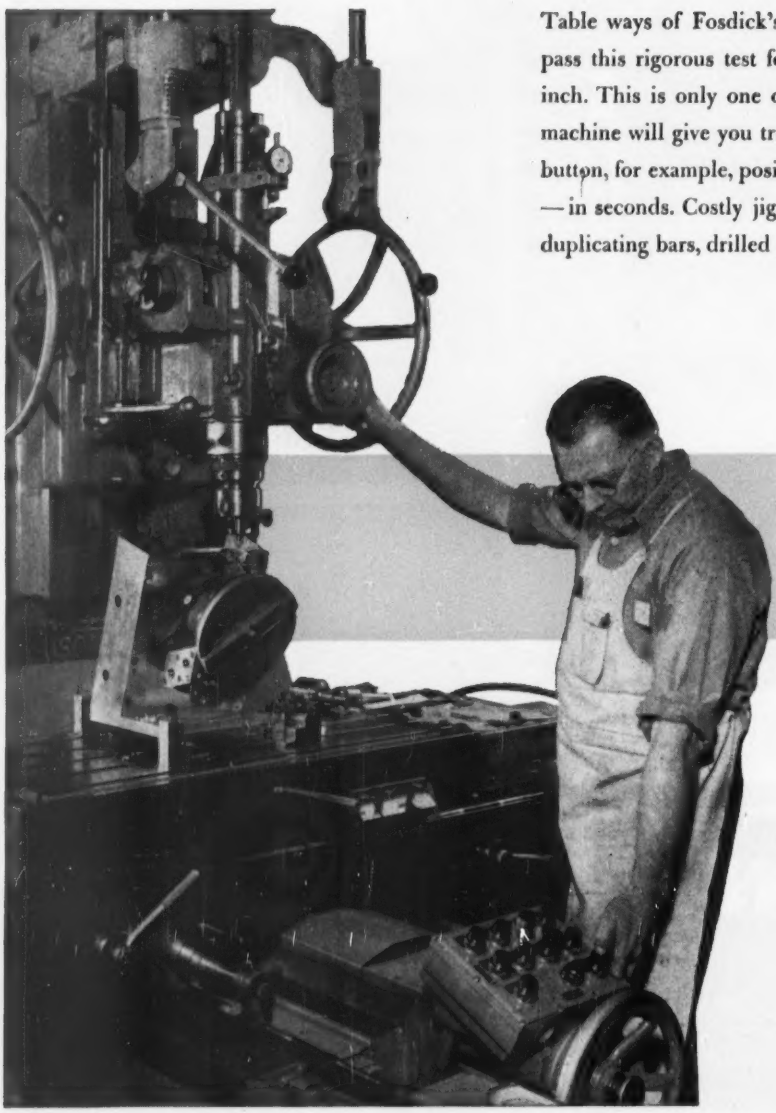


Table ways of Fosdick's Automatic Positioning Machine must pass this rigorous test for flatness—within 40 millionths of an inch. This is only one of many tests we run to make sure this machine will give you true precision production. The touch of a button, for example, positions work for each new hole to ± .0001″ —in seconds. Costly jigs have been replaced by two 5/8″ square duplicating bars, drilled quickly for the job, stored easily.

to give you

Boring Time "Nose Dives" at Fairchild.

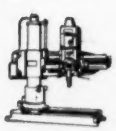
Mass production of precision magnesium housings for commercial and military cabin pressurizers at Fairchild Engine and Airplane Corp. demanded speed and high accuracy. Fosdick's proposal recommended Automatic Positioning Machines. Now Fairchild drills, faces and bores 31/32″ holes with accuracy to ± .0001″— *has slashed boring time 40% over former methods.*



For full description of the Automatic Positioning Machine ask for Bulletin APM

precision production like this

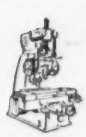
Need Drilling Equipment? Get a Proposal from Fosdick!


Radial Drills


Jig Borers


Sensitive and Upright Drills


Sensitive Radial Drills


Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

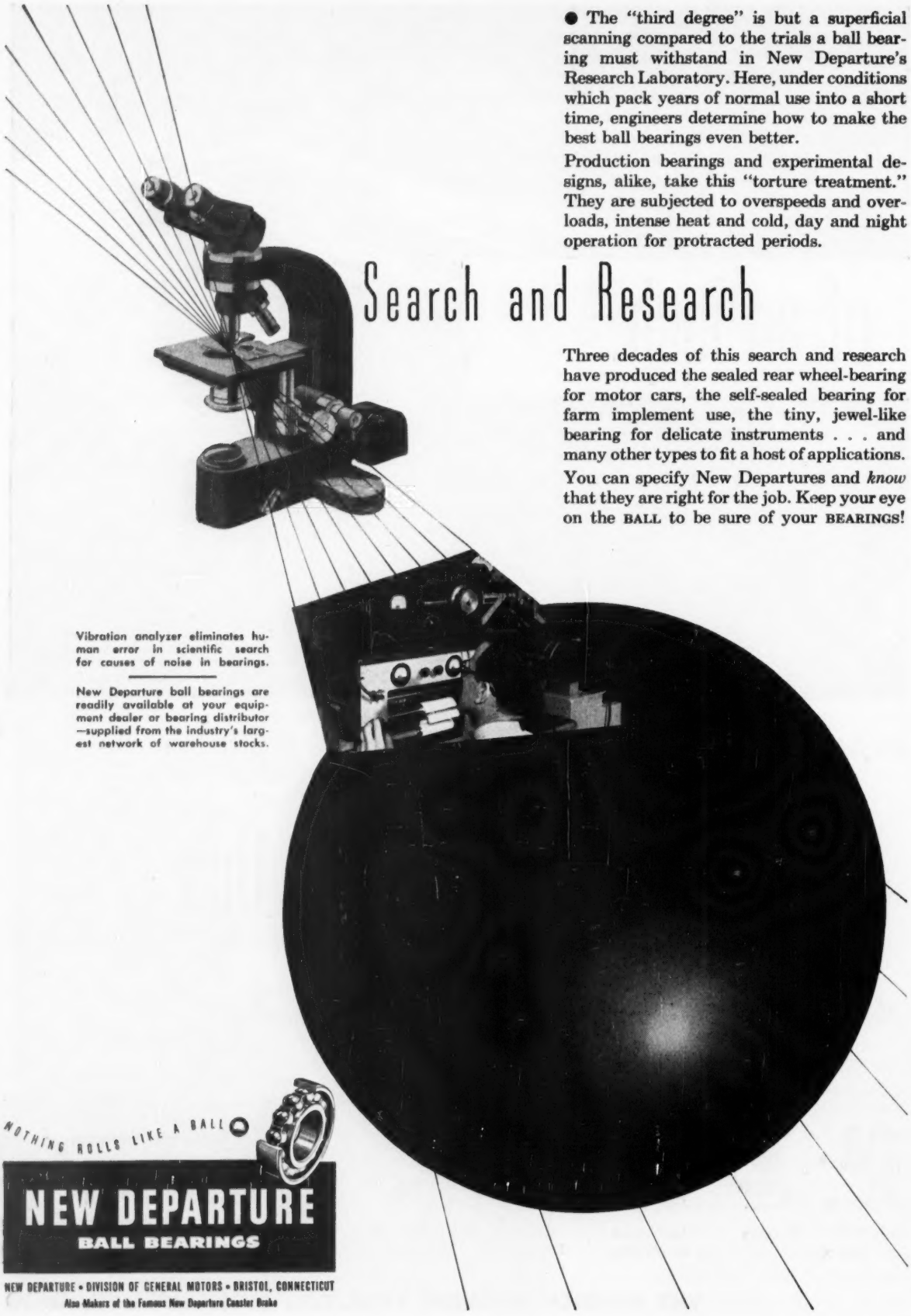
Search and Research

● The "third degree" is but a superficial scanning compared to the trials a ball bearing must withstand in New Departure's Research Laboratory. Here, under conditions which pack years of normal use into a short time, engineers determine how to make the best ball bearings even better.

Production bearings and experimental designs, alike, take this "torture treatment." They are subjected to overspeeds and overloads, intense heat and cold, day and night operation for protracted periods.

Three decades of this search and research have produced the sealed rear wheel-bearing for motor cars, the self-sealed bearing for farm implement use, the tiny, jewel-like bearing for delicate instruments . . . and many other types to fit a host of applications.

You can specify New Departures and *know* that they are right for the job. Keep your eye on the BALL to be sure of your BEARINGS!



Vibration analyzer eliminates human error in scientific search for causes of noise in bearings.

New Departure ball bearings are readily available at your equipment dealer or bearing distributor —supplied from the industry's largest network of warehouse stocks.

NOTHING ROLLS LIKE A BALL

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Also Makers of the Famous New Departure Coaster Brake

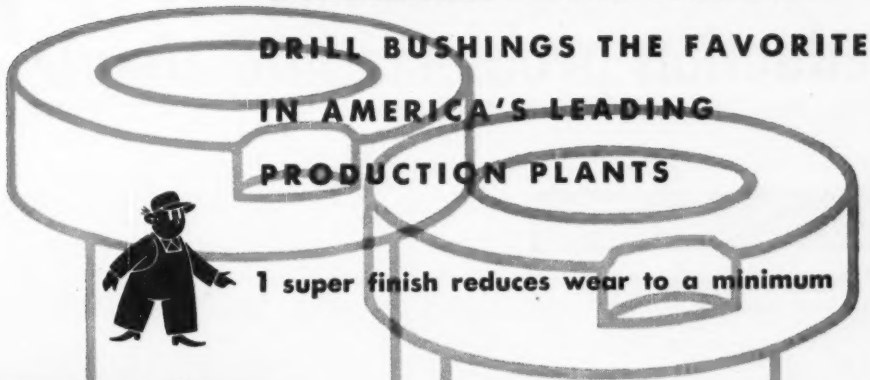
FIVE FACTORS THAT MAKE

UNIVERSAL SUPER FINISHED

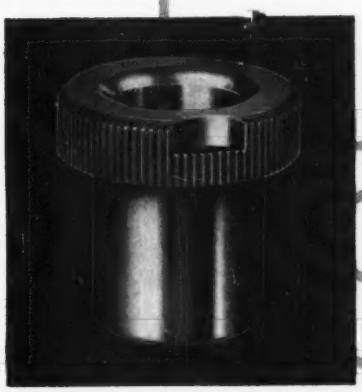
DRILL BUSHINGS THE FAVORITE

IN AMERICA'S LEADING

PRODUCTION PLANTS



1 super finish reduces wear to a minimum



2 blended radius reduces tool hang up

3 100% concentricity and hardness tests assure accuracy

4 knurled head provides quick sure grip

5 complete variety of sizes and lengths

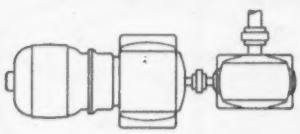


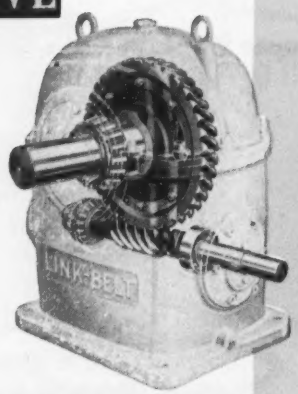


How to change even complex speed reduction problems into *simple* ones

WORM GEAR DRIVE

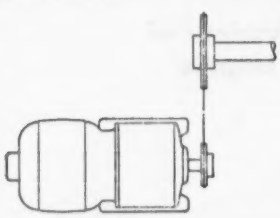
WORM GEAR and P.I.V. variable speed drives are shown direct-coupled. Link-Belt worm gear drives are available in 3.1:1 to 8000:1 reduction ratios—1400 to 123,000 in. lbs. torque—0.22 to 564 output shaft rpm. Ask for Book 2324A.

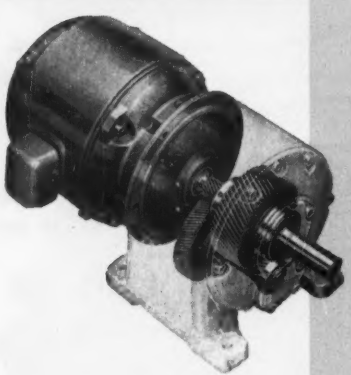




GEARMOTOR & HELICAL GEAR DRIVE

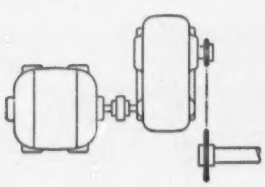
GEARMOTOR is shown with roller chain drive. Link-Belt Helical Gear Drives, Gearmotors and Motogears are available in 6.2:1 to 292:1 reduction ratios—1 to 30 hp—6 to 280 output shaft rpm. Ask for Books 2247 and 2451.

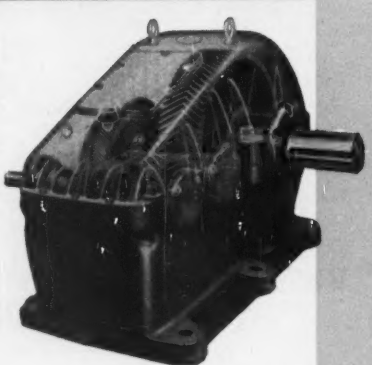




HERRINGBONE GEAR DRIVE

HERRINGBONE GEAR DRIVE is shown connected by flexible coupling to motor and with roller chain take-off. Link-Belt Herringbone Gear Drives are available in 2.84:1 to 326:1 ratios—0.4 to 2480 hp—2.2 to 623 output shaft rpm. Ask for Book 2519.





Get the proper drive combination that best meets your requirements from the broad LINK-BELT line

In addition to matching a wide range of requirements for ratio, hp, loading conditions and similar factors—Link-Belt enclosed gear drives offer you other benefits. When your Link-Belt representative selects a helical, herringbone or worm gear drive, you have no worries about coordinating it with your other components.

For Link-Belt builds a complete power transmission line. There's no need to exchange drawings with a third person to calculate chain, sprocket, coupling, bearing or even shafting requirements. You can get all these from one source . . . each pre-engineered for perfect fit.

Next time you're faced with a speed reduction problem, take it to power transmission headquarters. There's a Link-Belt sales office or distributor near you. Call today for complete engineering information.

LINK-BELT

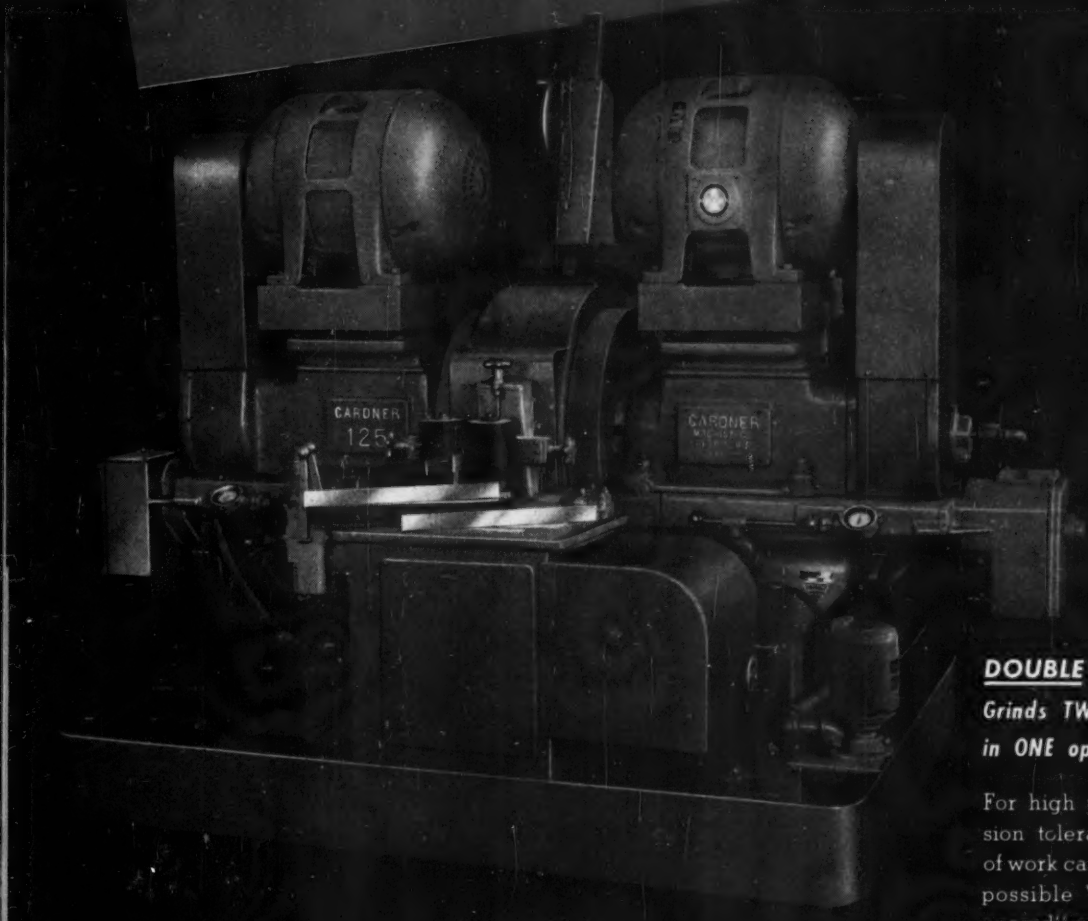
ENCLOSED GEAR DRIVES

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

13,128

GARDNER
precision disc Grinders

Three Machines That Will Reduce Your Flat Surface Grinding Costs

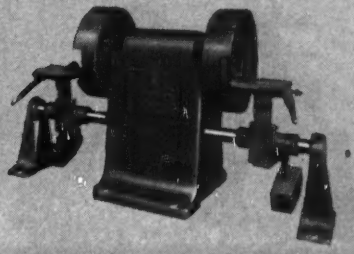


DOUBLE SPINDLE GRINDER

Grinds TWO Parallel Surfaces in ONE operation

For high production to precision tolerances. Wide choice of work carrying fixtures makes possible "individually engineered" machines at low cost.

SINGLE SPINDLE GRINDER



Gardner No. 226-26" Standard Single Spindle Grinder with hand-operated lever tables on each end. A general purpose machine with wide industry applications.

HORIZONTAL DISC GRINDER



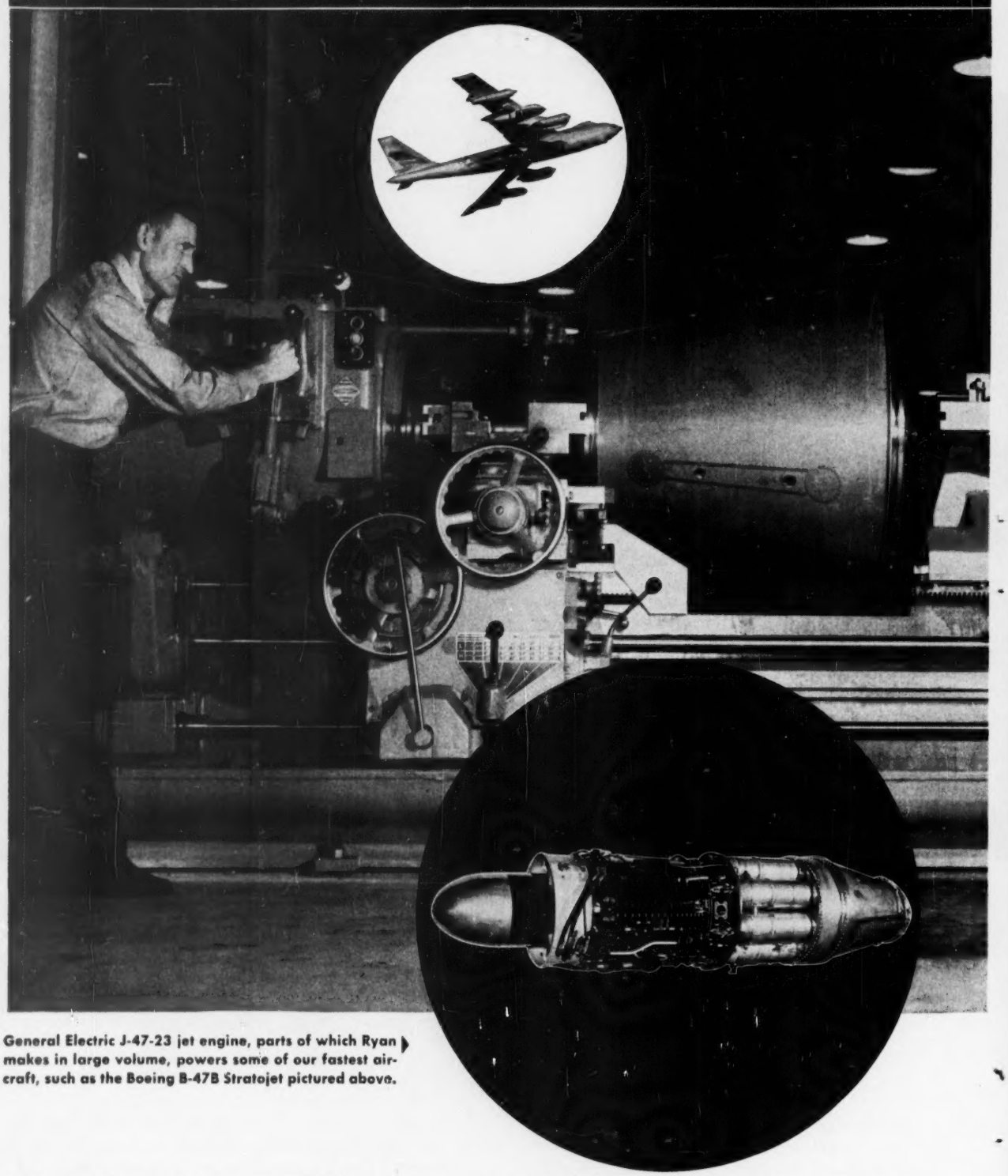
Gardner No. 124-53" Horizontal Disc Grinder used for grinding a flat surface on castings and weldments in a wide variety of sizes and shapes.

No. 119M

GARDNER MACHINE COMPANY

414 East Gardner Street · Beloit, Wisconsin, U. S. A.

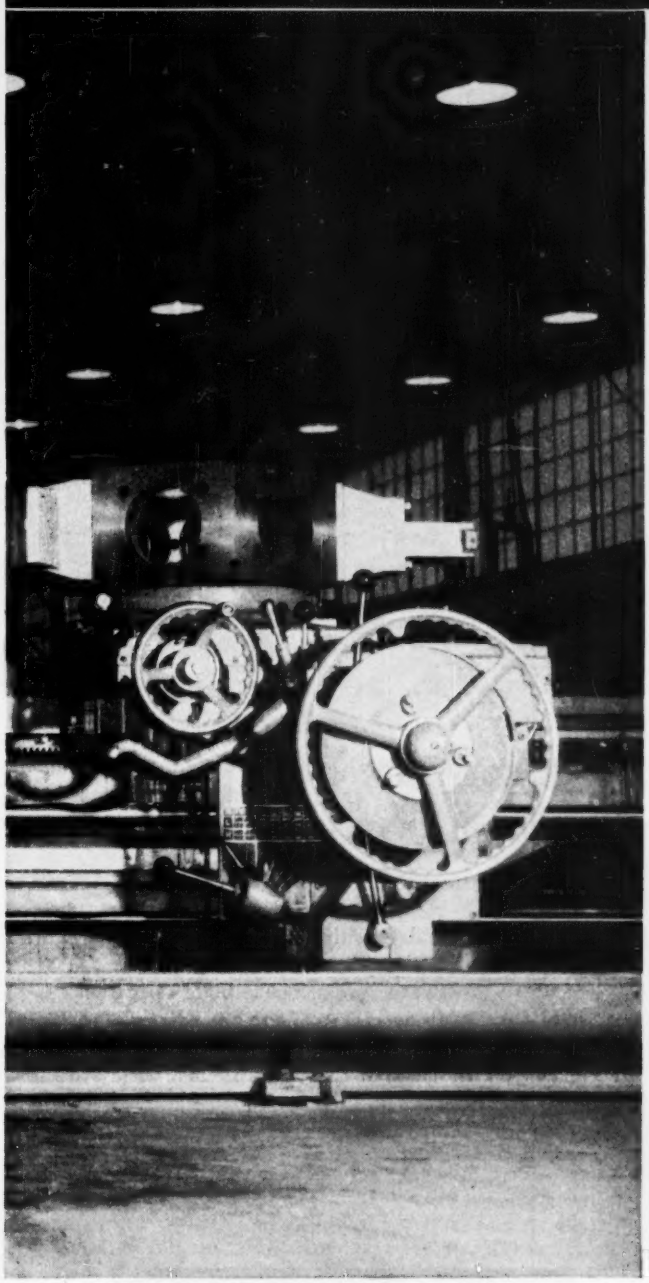
WARNER & SWASEYS HELP SPEED



General Electric J-47-23 jet engine, parts of which Ryan makes in large volume, powers some of our fastest aircraft, such as the Boeing B-47B Stratojet pictured above.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

JET ENGINE PRODUCTION . . .



Warner & Swasey 4-A Heavy Duty Turret Lathe simultaneously machining flanges on each end of exhaust cone for jet engine.

Turret lathes cut machining time in half on vital part

MACHINING TIME CUT IN HALF! Two setups replaced by one! Storage problems eliminated! Handling drastically reduced! These are reports from Ryan Aeronautical Company after the first of six modified Warner & Swasey 4-A Heavy Duty Turret Lathes took over work on one phase of jet engine components production.

This Warner & Swasey was especially designed with special tools and tool holders to machine the flanges on each end of the jet engine's big heavy-gauge, stainless steel exhaust cone. Prior to its installation, Ryan had to set up and machine the flanges on one end of each of a dozen cones, then store the cones around a machine until the new tooling setup was completed and the other ends of the cones machined.

Now, with the Warner & Swasey, the flanges on both ends are machined simultaneously. Cutting tools turn and form the flanges in one pass to 50 micro-inch smoothness. Only one setup is required for each cone, and as its flanges are machined, it is sent on down the production line. Scarce floor space is saved, and handling minimized.

Here is another example of how a Warner & Swasey Field Engineer, working with a company's production men, helped apply Warner & Swasey experience and "know how" to solve a tough production problem. Our nearest Field Engineer will also be glad to work with you and will recommend the right machines to fill your high precision machining requirements.

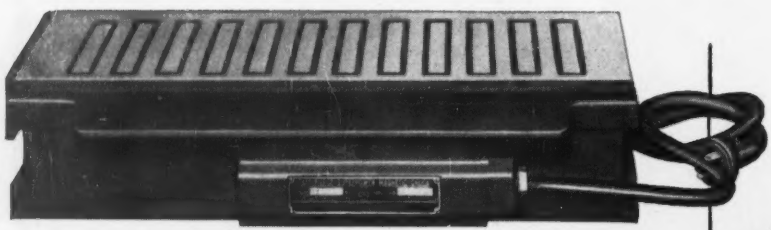
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

MORE POWER

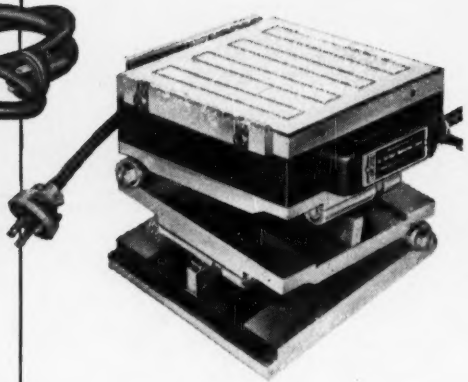
...IN LESS SPACE!

with Taft-Peirce SUPERPOWER Magnetic Chucks



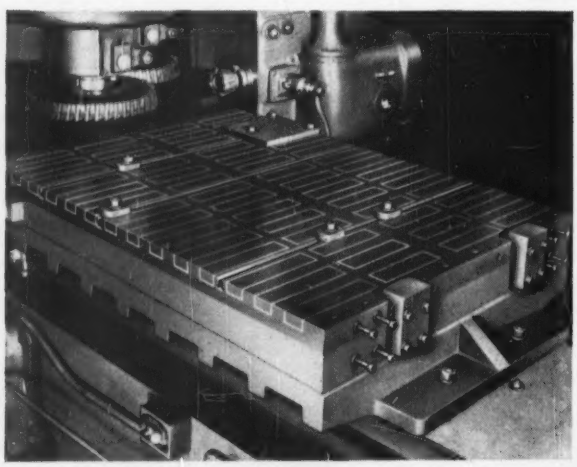
T-P SUPERPOWER RECTANGULAR CHUCKS

Pack *more* power in less space to increase versatility, speed, and safety of setups. Also available in fine mesh styles for securing extremely small or thin sections . . . or with longitudinal pole pieces for holding wide range of work-sizes.



T-P SUPERPOWER SINE ANGLE CHUCK

Speeds positioning of tricky angle grinding jobs. Gage blocks placed between roll and base plate assure high precision of compound angle setups. Typical of the wide range of Taft-Peirce adjustable magnetic chucks built to help make accurate setups faster.



T-P SPECIAL SUPERPOWER CHUCKS

55½" x 40" chuck shown holds cast iron loomsides on a 75 HP milling machine, while three 18" carbide cutters and two 4" face mills take ¼" cuts simultaneously . . . at 30" per minute! Its greater holding power, smaller size, and high efficiency are typical of all T-P Superpower designs — whether special or standard models.

For the complete story on these items and many more, get your copy of the New Taft-Peirce Handbook.

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY
Woonsocket, Rhode Island

OCHSENBEIN 52



Operators Know It's Their Good Fortune . . .

No wonder metal cutting operators say every day is a lucky day for them when CIMCOOL° is on the job. For this radically new and different coolant *makes jobs better . . . and does a better job!*

It's crystal-clear why operators call Cimcool the biggest working improvement in years. This revolutionary cutting fluid—this *chemical emulsion*—virtually eliminates rancidity and foul odors—even in the hottest weather! Can't burn. Can't smoke. Has no objectionable odor of its own. Doesn't soil hands or clothes and contains no skin irritants. Leaves no hazardous slippery film on the hands, machine, work or floor. And Cimcool cools so fast that tools and chips actually stay cool to the touch.

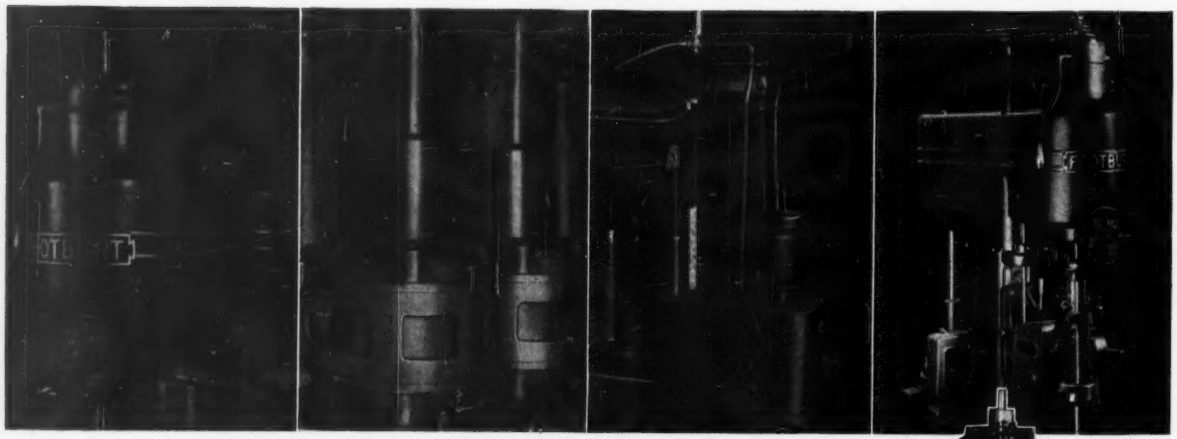
We predict that one week's run will convince you that Cimcool is far superior to old-fashioned coolants. For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.



FOOTBURT

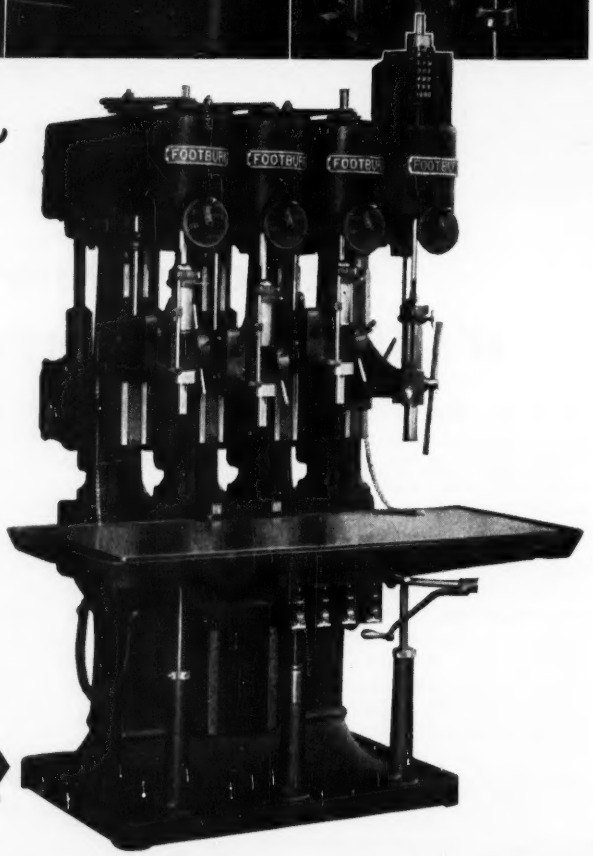
faster for tool room or assembly line



engineered for production

The choice of fine machine tools now will help you meet those new production schedules. Footburt Sensatives are built with the wide range of speeds and with power and sturdiness to drive cutting tools to their full capacity. They are built with the care and precision that will keep them accurate over a long period. Write, wire or phone for prices and delivery information.

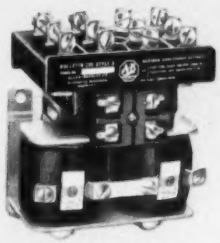
THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building



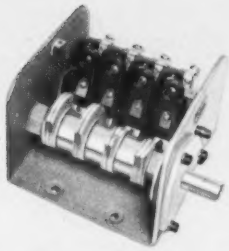
No. 2 Machine with Back Gear • 12" Overhang • ¾" Drilling Capacity in Steel • Optional Speed Ranges • 185 to 2300 RPM • 280 to 3450 RPM • Vertical Motor Drive with Standard Single Speed Motor • Power Feed Assembly • Tapping Attachment • Coolant Outfit.

FOOTBURT

machine tools—



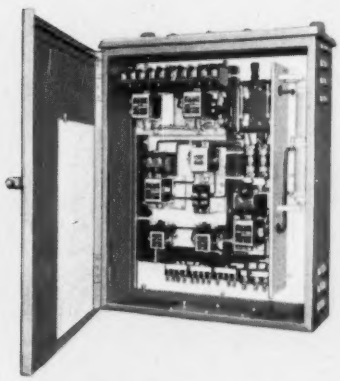
Bulletin 705 Reversing Switch for small a-c and d-c motors



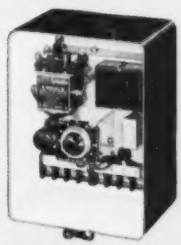
Bulletin 801 Rotating Adjustable Cam Limit Switch. Heavy duty



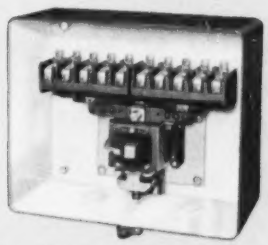
Bulletin 850 Motor Driven Timer for automatic process control



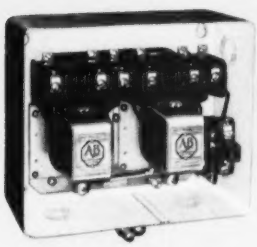
Bulletin 290R D-C Reduced Voltage, Reversing Starter for marine service



Bulletin 852 Electronic Time Delay Relay for precision timing



Bulletin 704 Nine-pole Permanent Magnet Contactor. Noiseless



Bulletin 205 Size 1 Reversing Switch for direct current motors



Bulletin 350 Drum Switch for reversing small a-c and d-c motors



Bulletin 365 Drum Controller for multispeed a-c motors

Some Useful Units in the

ALLEN-BRADLEY LINE

The standard Allen-Bradley line includes a wide range of solenoid operated across-the-line starters, combination starters, reversing switches, reduced voltage starters, and multispeed controls . . . not to mention an extensive variety of relays, contactors, and accessories.

And that is not all!

It also includes many other useful items . . . a few of which are shown here. They find application in the process industries, in marine service, in laundries, and in many other industries. All are designed for long, trouble free life and built to the widely recognized QUALITY standards that apply to the entire Allen-Bradley line.

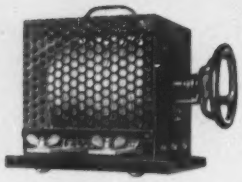
If you use motor controls . . . it will pay you to become acquainted with the latest Allen-Bradley Catalog. May we send you a copy?

Allen-Bradley Co.
1316 S. Second St. · Milwaukee 4, Wisconsin

A-B Quality

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

2-53-MR



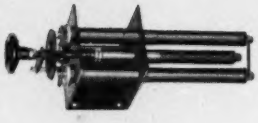
Bulletin 470 Graphite Disc Rheostat for laboratories



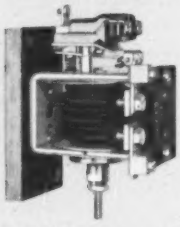
Bulletin 500 Knee and Foot Controllers for sewing machines



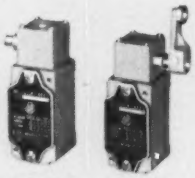
Bulletin 802 Foot Switch for heavy duty, rough service



Bulletin 410 Graphite Disc Rheostat for stepless control



Bulletin 809 Instantaneous Current Jam-type Relay



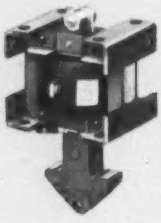
Bulletin 802 Limit Switches with various operating levers



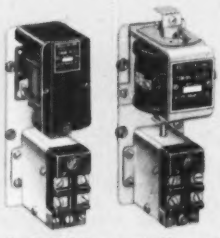
Bulletin 600 Switch with overload breaker and pilot light



Bulletin 848 Dashpot Timing Relay. Maximum interval 30 sec.



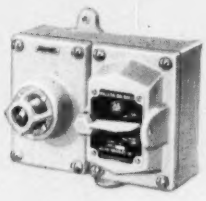
Bulletin 860 A-C Solenoid supplied in variety of ratings



Bulletin 849 Pneumatic Timers for machine tool service



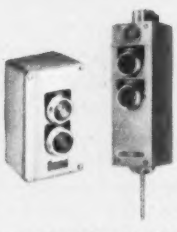
Bulletin 202 D-C Contactors for applications up to 150 amperes



Bulletin 600 Watertight Starting Switch with pilot light



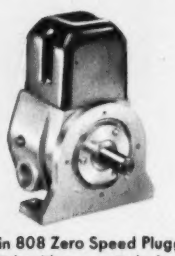
Bulletin 840 Float Switch operated by float and chain



Bulletin 800T Oiltight Push Buttons for machine tools



Bulletin 801 Rocker Arm Limit Switch for reversing service



Bulletin 808 Zero Speed Plugging Switch with magnetic lockout

Popular Accessories

in THE ALLEN-BRADLEY LINE

Above are shown a few Allen-Bradley control accessories. The variety of these units reveals the wide scope of the complete Allen-Bradley line. To machinery designers and plant engineers, the Allen-Bradley Catalog is a treasure house of standard control accessories which can be used in innumerable combinations to solve virtually any control problem. May we send you a copy of this Handy Catalog?

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.



Look for the A-B trademark. It is a guarantee of Quality

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

2-53-MR

It keeps a Separate Count of each shift's production!

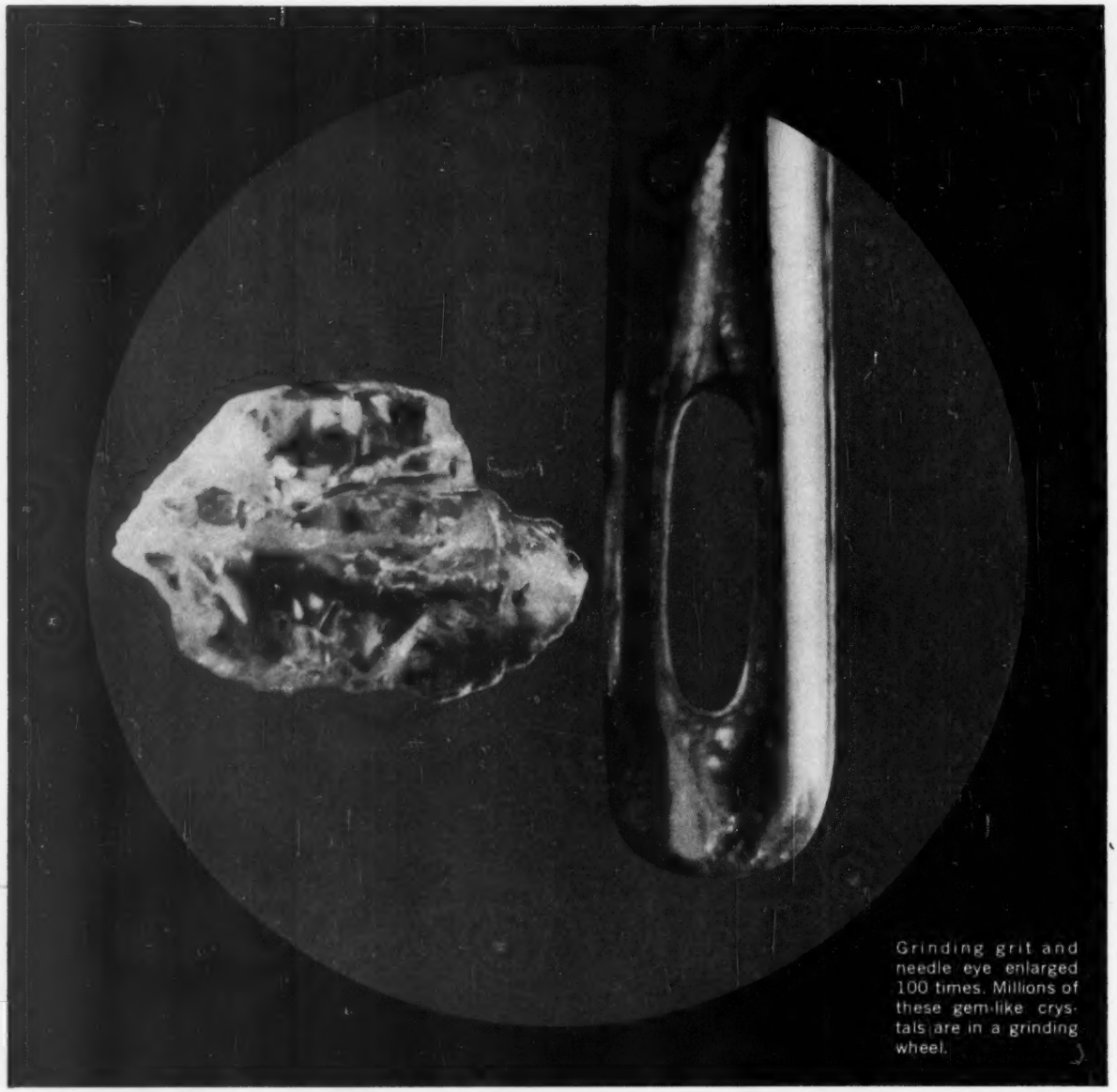


Added Evidence that

Everyone Can Count on VEEDER-ROOT

Here's a counter whose "count-ability" challenges your imagination. For this counter records, on a separate counting unit, the production of 1, 2, 3, or more shifts. The additional 4th unit can be used as a run or batch counter. These Veeder-Root 2-3-4 Convertible Shift Counters are applicable to a wide variety of production machines, to count in practically any unit desired . . . revs, strokes, pieces, or what do *you* want to count? *Write*:

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONNECTICUT
New York 19, N. Y. • Chicago 6, Ill. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
Offices and Agents in Principal Cities



Grinding grit and needle eye enlarged 100 times. Millions of these gem-like crystals are in a grinding wheel.

GRINDING GRIT IS START OF NEW CONCEPT THAT LED TO CINCINNATI GRINDING WHEELS

Sometimes looks deceive. A tiny grinding grit like the one above does not look like a cutting tool. It has no recognizable clearance or rake angles . . . no cutting edge is apparent . . . it cannot be accurately shaped . . . and it is very fragile.

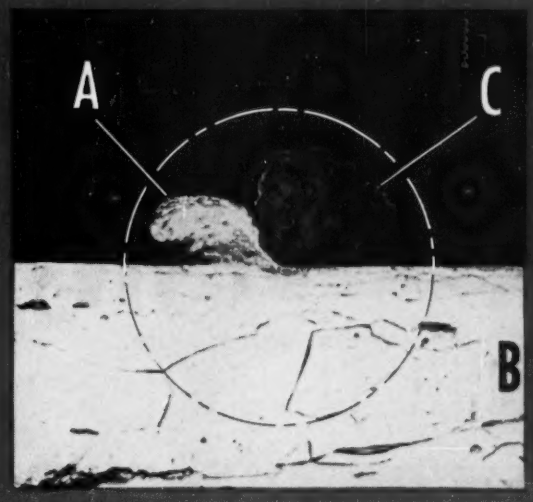
Nevertheless, the grinding grit is a true cutting tool that functions in virtually the same manner as a tooth of a milling cutter.

Research discoveries by Cincinnati Milling proved, beyond doubt, that the grinding process is a true metal cutting process. The grinding grits do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.

This entirely new approach is not based on hasty conclusions. It represents 25 years of Cincinnati Milling research, coupled with practical experience in applying the basic fundamentals of grinding to a wide variety of work on both centerless and centertype machines.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools forming true chips.

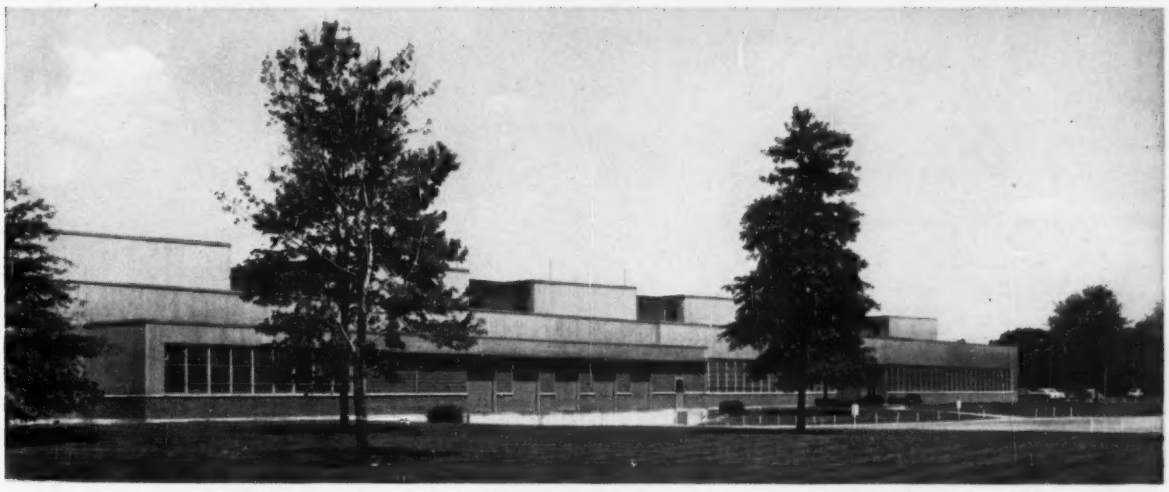
Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of Cincinnati Grinding Wheels, write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co.



Frozen Action—Tiny steel chip (A) is shown being cut from workpiece (B) by a grinding grit (C).



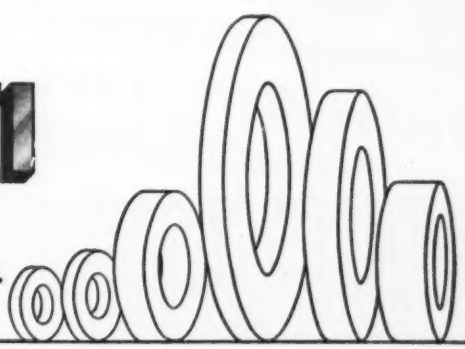
RESEARCH GRINDING problems have ranged from the grinding of surgical sutures .004" in diameter to steel mill rolls 60" in diameter.



Front of the new, completely modern Cincinnati Milling plant where Cincinnati Grinding Wheels are manufactured.

FREE BOOKLET. Now available to industry is a new booklet entitled "A New Concept In Grinding wheels." It contains valuable information for everyone interested in grinding operations. A copy is yours for the asking. Just write Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

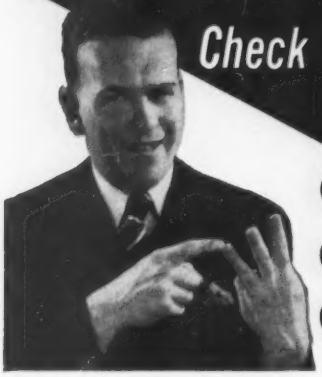
CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



OCHSENREITER

HYDRATROL LATHES

LARGE HOLLOW SPINDLE TYPE



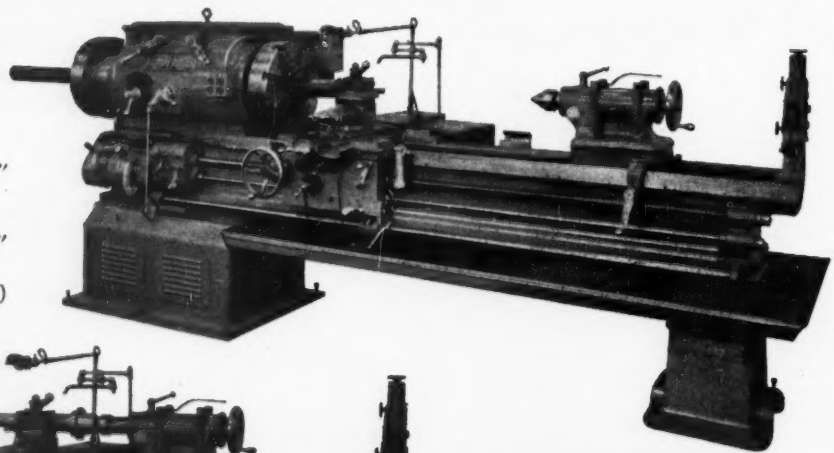
Check These 3 Points of... versatility

1. Machine long work chucked through spindle.
2. Machine work between centers.
3. Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

SIZES 18" TO 36"

Small — 18" & 20" up to 7⅛" Hole
Medium — 25" up to 12" Hole
Large — 32" & 36" up to 16⅛" Hole
(Standard Type Lathes 16"-36")





IMPORTANT FEATURES

Timken Bearing Spindles.

Hydraulic clutches for forward and reverse, controlled from apron or headstock.

Hydraulic brake for close position control.

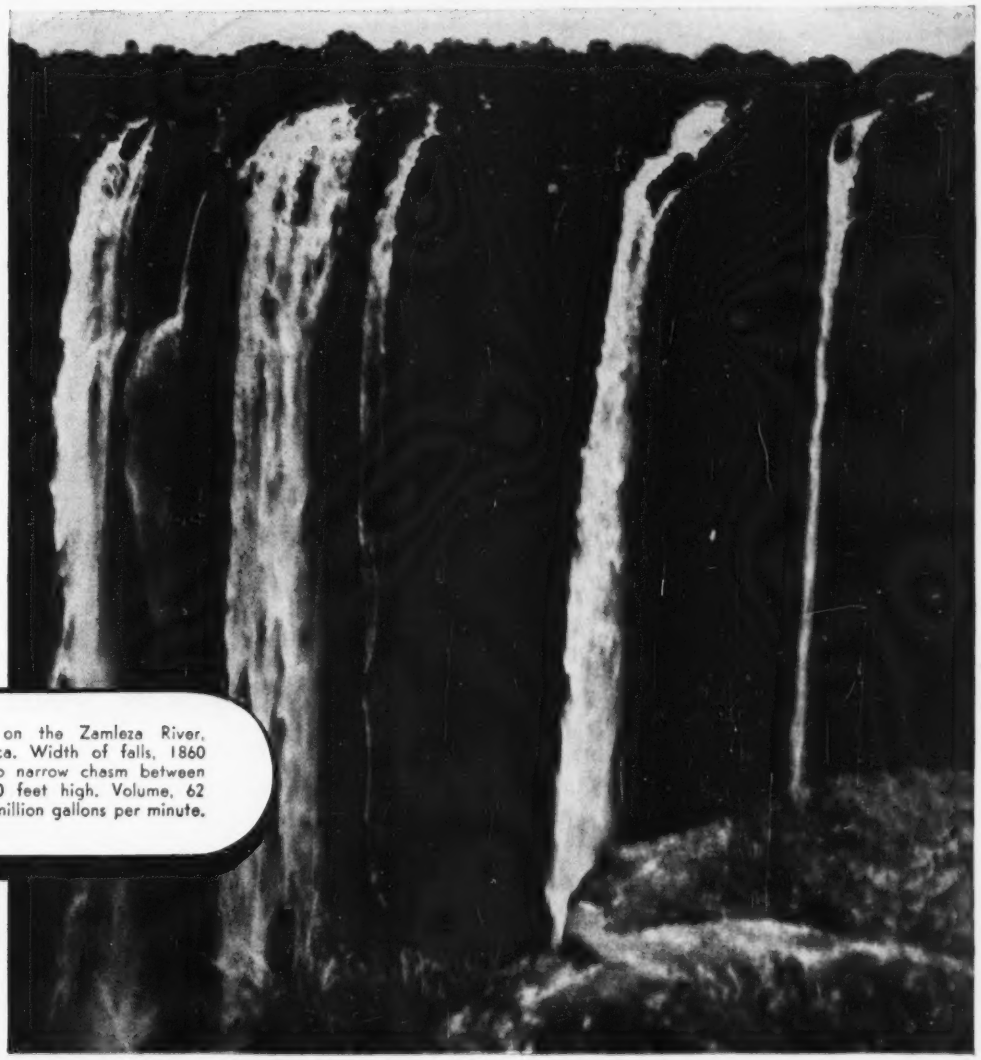
Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

For Faster Production, Better Work, Lower Costs!

LEHMANN MACHINE COMPANY

CHOUTEAU AT GRAND • SAINT LOUIS 3, MISSOURI

LOGAN FLUID POWER • DURABLE, DEPENDABLE SINCE 1916



Victoria Falls on the Zamleza River, Rhodesia, Africa. Width of falls, 1860 feet. Spills into narrow chasm between sheer walls 400 feet high. Volume, 62 million to 100 million gallons per minute.



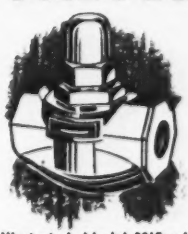
Illustrated, Model 4095—4-way, 2-position valve for directing pressure alternately to ends of double-acting hydraulic cylinder.

LOGAN HYDRAULIC CONTROL VALVES

A broad range of types and sizes to most effectively meet any requirement—Design Engineers, Machine Operators, Maintenance Men appreciate these Logan advantages

- LONG-LIFE CONSTRUCTION
- EASY TO SERVICE
- INFREQUENT MAINTENANCE
- EASE OF INSTALLATION
- EFFORTLESS OPERATION
- UNRESTRICTED PORTING

Let Logan Engineers help you design your Air and Hydraulic Circuits



Illustrated, Model 8015 adjustable speed control valve. Install between operating valve and one end of cylinder to meter flow of oil in one direction with free flow on return.

LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS

FREE CATALOG ON REQUEST

AIR CONTROL VALVES, Cat. 100-4 . AIR CHUCKS, Cat. 70-1 . AIR CYLINDERS, Cat. 100-1 . AIR-DRAULIC CYLINDERS, Cat. 100-3
AIR and HYDRAULIC PRESSES, Cat. 51 . COLLET GRIP TUBE FITTINGS, Cat. 200-5 . HYDRAULIC CONTROL VALVES, Cat. 200-4
HYDRAULIC CYLINDERS, Cats. 200-2; 200-3 . HYDRAULIC POWER UNITS, Cat. 200-1 . SURE-FLOW COOLANT PUMPS, Cat. 62

SAVES TIME — Logan — AIR AND HYDRAULIC EQUIPMENT — SPEEDS MOTION

LOGANSPORT MACHINE CO., INC., 510 CENTER AVE., LOGANSPORT, IND.



How many of your lathes should get a gold watch?

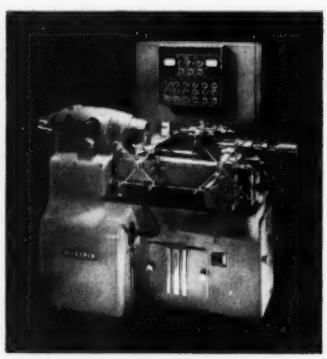
A lathe's retirement age, unlike people's, can't be determined by a set number of years of faithful service. It might be ten years . . . . eight . . . . or even one.

It boils down to a matter of comparison.

If you have a lathe that can't produce as much, as cheaply, as one of today's models —like the Monarch line—give it a watch! Then, for heaven's sake—*retire it!*

For today, more than ever before, operating costs are a major concern of every business. Today, higher output and low costs are real market factors—and provide the best reason in the world for wide-awake management to recognize obsolescence as an operating actuality.

Reward those tired old lathes with the gold watch of retirement. Then watch your new Monarchs make time! *The Monarch Machine Tool Company, Sidney, Ohio.*



Monarch—for almost a half-century a pioneer and leader in the development of fine lathes for production line and toolroom.

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES



For any gear to work efficiently and give Long Service Life, it *must* be a "*perfect mate*" with the other gear (or gears) with which it is to mesh—this applies to Spurs, Helicals, Spiral-Bevels, Worms, Herringbones, etc. . . . no gear by itself is worth much.

At "Phillie Gear", we have "specialized" for over 60 years in making all our gears "*Perfect Mates*",—and, to accomplish this, we use only the latest gear machines; the finest metals and alloys, and the latest methods—not only for gear cutting, but also for Machining, Heat Treating, Hardening, Shaving, Lapping, Inspection, and Shipping.

So, if you need any Type, Size or Quantity of Gears,—*consult "Phillie Gear" Engineers first.*

You'll want a free copy of the well-known "Gear Book" . . . it's practically a "treatise" on gears.



Philadelphia Gear Works, INC.



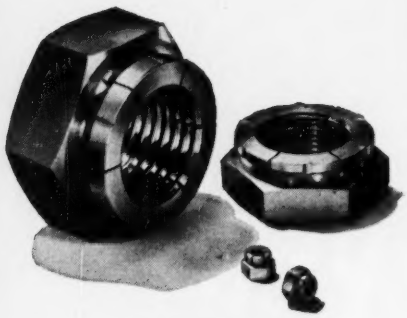
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK · PITTSBURGH · CHICAGO · HOUSTON · LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



PHILADELPHIA TRANSPORTATION COMPANY, Philadelphia, Pa., uses FLEXLOC Self-Locking Nuts on the rear axle flanges of its buses. This carrier has found that FLEXLOCs eliminate sheared studs, reduce maintenance, save time and money.



How FLEXLOC locknuts work

FLEXLOCs lock and stay put on a threaded member regardless of the vibration encountered. Here's how they work. The slotted top or locking section is divided into six equal, flexible segments, closed in to make the inside diameter of the nut smaller than that of the companion bolt. When the FLEXLOC is applied, these are expanded by the bolt. The spring tension of the resilient segments locks the nut securely at any desired position on the bolt once the locking threads are fully engaged.

FLEXLOCs can be used over and over again. When expanded by the bolt, the locking section remains within the elastic limit of the metal. This permits the locking segments to return to their normal position, ready for reapplication to the bolt.

FLEXLOCs are one piece, all metal—nothing to assemble, come apart, lose or forget. They can be delivered in any quantity in a wide range of sizes. Stocks are carried by industrial distributors everywhere. Write for literature and samples. SPS, Jenkintown 19, Pa.

FLEXLOC®

LOCKNUT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

Our Fiftieth Year : A START FOR THE FUTURE

Production Pointers from GISHOLT

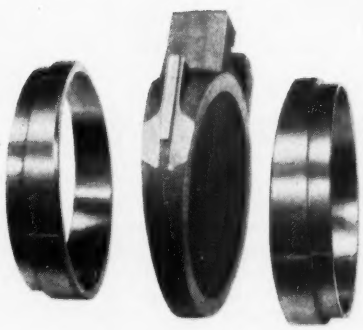
TIME-SAVING IDEAS



Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

AN EXCELLENT WAY TO MACHINE GATE VALVE PARTS

No. 12 Hydraulic Lathe Performs 5 Operations with One Set of Tools



Valve seat rings and gate wedges.

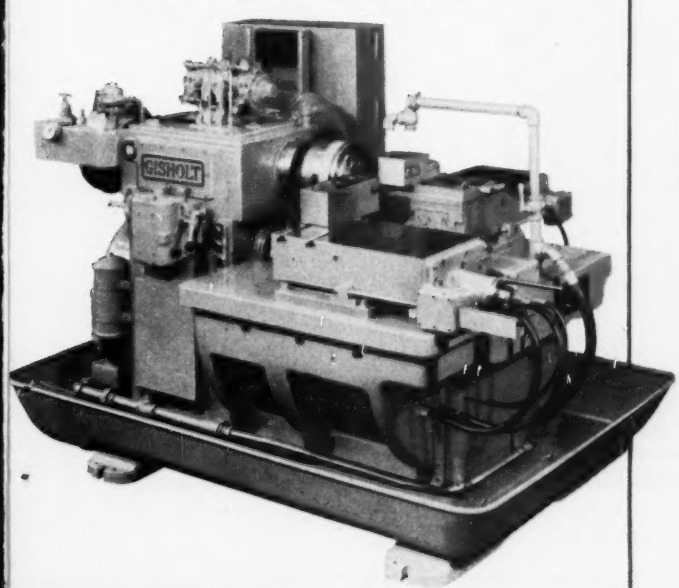
Here is an efficient setup for producing seat rings and slotted wedges for gate valves. A Gisholt No. 12 Hydraulic Automatic Lathe is doing the work on the stainless steel parts requiring close tolerances.

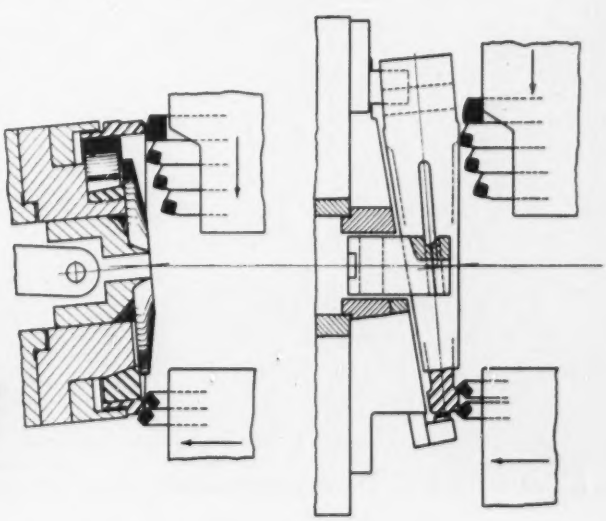
A total of six tools is used to machine the 8" five-degree valve seat rings which are held in a special fixture. Tools on the rear slide rough and finish face while tools on the front slide chamfer inside and outside the seat diameters. The workpiece is held on an air-operated expanding mandrel set at five degrees from the spindle axis. Time is only 3 minutes floor-to-floor.

Changeover for machining the wedges is fast and easy. The same tooling is used and a 2-jaw chuck replaces the fixture. The gates are then machined on one side. To do the next side, the workpiece is reversed. After this operation the part is heat-treated. It is then returned to the No. 12 and light finishing cuts are taken on both sides, leaving a 30 to 40 micro inch RMS finish. Time for each side is 2 minutes. Locating blocks are adjustable and different sizes can be handled with this setup.

This No. 12 Hydraulic Lathe with its completely automatic cycle, and well planned tooling handles various sizes of two different parts.

The No. 12 Hydraulic Automatic Lathe.





Tooling and fixture for machining seat rings.

Same tooling with 2-jaw chuck for wedges.

GISHOLT

TIME-SAVING IDEAS

TRY THIS TIME-SAVER ON MULTIPLE FACE PARTS

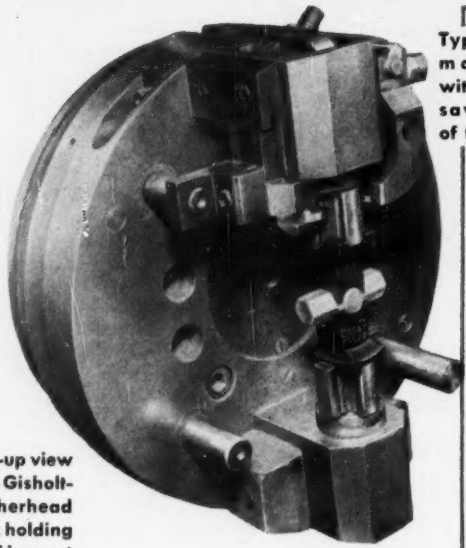
Work is Indexed Without Stopping Spindle

Do you have the problem of machining two or more sides or ends of small parts? The Gisholt-Weatherhead chuck, mounted on a No. 5 Ram Type Turret Lathe, can be your time-saving solution.

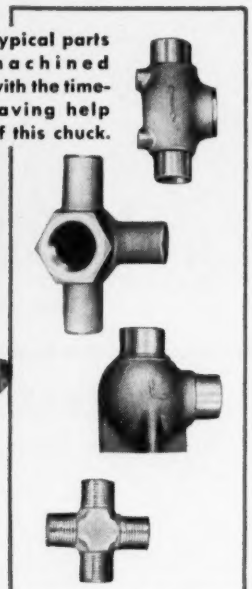
This quick-indexing, two-jaw chuck is air-operated. It permits you to index the workpiece *without* stopping the spindle. It's an important time-saving feature that means more production per hour; easier work for the operator.

If you machine small to medium size valves, cocks, tees, ells, crosses and similar multiple station parts, you should have full information on the Gisholt-Weatherhead chuck. Ask for the Gisholt Chuck catalog.

Here's a Production Pointer that tells how to machine similar faces of parts without unchucking the part . . . or even stopping the spindle.



Close-up view of the Gisholt-Weatherhead chuck holding small part machined on all four sides.



Typical parts machined with the time-saving help of this chuck.

ON JOBS LIKE THIS POWER AND RUGGEDNESS PAY OFF

Big Saddle Type Lathe Has Cross Feeding Turret

For hogging off metal on hefty parts, like this heavy steel aircraft engine crankcase section, it takes a machine with plenty of power and rigidity.

This big 5L Saddle Type Lathe with its 36½" swing over the bedways is up to the job on both counts. It's equipped with a 50 H.P. driving motor and has a cross-feeding turret. There's a special tool block mounted on one face of the hexagon turret which feeds into the work and then laterally so that the seven separate tools handle all operations. The rim is turned and faced, two diameters are bored and both OD and ID are rough formed—all in this one movement. Then the tools on the square turret finish form the OD and ID.

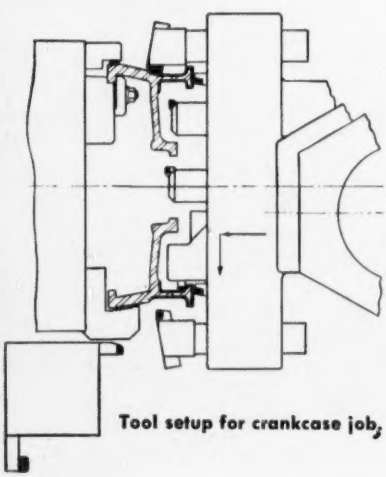
It's another case where the sheer power and ruggedness . . . plus combination tooling of a standard Gisholt Saddle Type Lathe . . . pay off on a special job. Once the job is completed, the machine can be quickly tooled for standard turret lathe work.

You should have the Bulletin on the 5L Saddle Type Lathe if your work is of this size. Write; we will also include information on standard tools.



Special tool block on the hexagon turret of 5L lathe.

Seven tools combined on one head plus a sturdy turret lathe give fast production on unusual job.



Tool setup for crankcase job.

GISHOLT

TIME-SAVING IDEAS

2 JOBS—1 MACHINE—1 TOOL SETUP

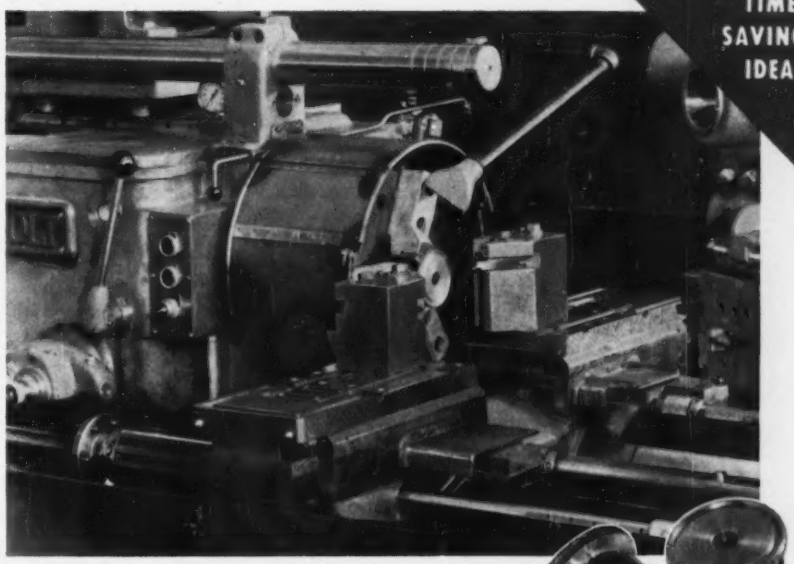
Valve Guide Machining Shows How It's Done

The two operations required to machine these valve guide parts are handled as separate jobs on this Fastermatic Automatic Turret Lathe. Yet, both jobs are done with just *one* set of tools on the hexagon turret.

For the first operation, tools are used in stations 1 and 2 of the hexagon turret. These do rough and finish turning while tools on the cross slides face, form and chamfer. Meanwhile, through the use of the reduced travel feature of the Fastermatic, the rest of the turret stations are by-passed.

For the second operation, the tools which were already set up and inactive in the first operation are now utilized. By merely changing the tools on the front and rear cross slides, the second operation is completely set up. This time tools on the hexagon turret do turning, boring and grooving, while tools on the cross slides face, form and chamfer.

This Fastermatic feature saves setup time and makes changeover fast and simple.



Close-up showing tooling on front and rear cross slides.

There's no re-tooling of the hexagon turret between operations on this job because all tools for both operations are there from the start.



Valve guide before and after machining.

HOW ALL ANGLES ARE COVERED ON THIS FAST SIMPLIMATIC JOB

Adjustable Tool Slides Cope with Different Cone Angles

Rotary rock bits for oil well drilling are big business. Here, production is getting a big boost by an excellent setup on a Gisholt Simplimatic Automatic Lathe.

It's handling first and second operations on the three types of bits shown in the drawing. In the first operation, front-slide turning tools turn the various angular outside surfaces. Time: 1.5 Min. f.t.f.

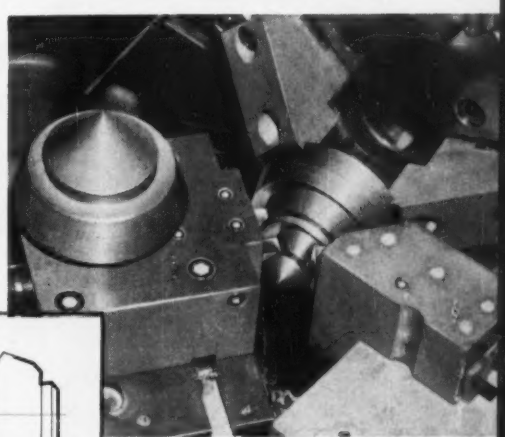
In the second operation, tools on the front and rear slides groove the cutter bits in only .8 minute.

A time-saving feature of the tool slides are their swivel bases which make them adjustable for machining the different cone angles required by the three types of bits.

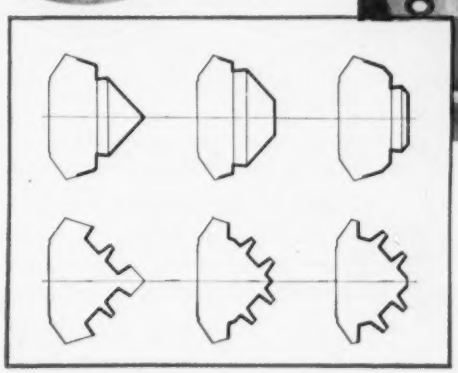
With one set of tools, this Simplimatic handles two operations on three types of rock bits—all having different angles.



Workpiece after first and second operations.



Second operation in machining rock bits.



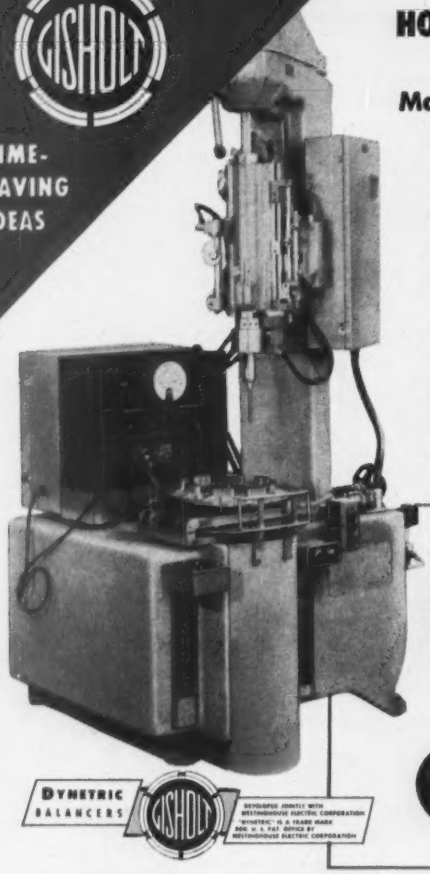
The 3 types of rock bits.

GISHOLT

TIME-SAVING IDEAS

HOW BALANCING HELPS TAKE THE SHAKES OUT OF TRACTORS

Machine Measures and Corrects Unbalance in Variety of Parts



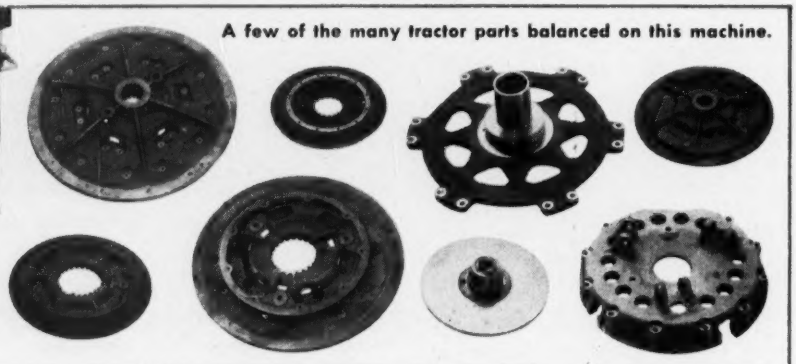
Balancing does wonders, as this tractor manufacturer has learned. Operation is smoother and vital parts last longer because flywheels and clutch components are precision balanced on a Gisholt 1SV1 DYNETRIC Balancer.

Static unbalance is measured, located and corrected on the one machine. The operator reads the amount of unbalance from the large meter. Correction is then made by the integral-mounted drill which removes the exact amount of metal to bring the part into balance.

This Balancer handles a wide assortment of parts, ranging from 10 to 65 lbs. and up to 21 inches in diameter. Special adapters are used to locate, support and hold each type of workpiece.

For full information on balancing, write for the booklet, "Static and Dynamic Balancing." Also ask for details on Gisholt Balancing School.

Static balancing is a quick, inexpensive operation that gives these tractor parts longer life with less vibration.



A few of the many tractor parts balanced on this machine.

50-SECOND SUPERFINISHING OPERATION—YEARS LONGER BEARING LIFE



Gisholt Model 51-A Cylindrical Superfinisher with workpiece in place.

Job Done Automatically

The part you see loaded in this Gisholt Model 51-A Superfinisher is a planetary gear housing. Two bearing diameters, one measuring 3⅛" and the other 1½", are being Superfinished:

The two-speed rough-and-finish machine cycle is predetermined, adjustable and fully automatic, except for loading. With the part held by an air-operated draw-back fixture, both bearing diameters are simultaneously Superfinished from approximately 20 micro inches RMS down to 6-8. A special upper oscillating head with two quill units, one standard and the other with 4" vertical travel, clears the workpiece for loading and unloading. Floor-to-floor time is only 50 seconds and production is 57-60 parts per hour at 80% efficiency.

Superfinishing, by ridding the bearing surfaces of smear metal, chatter marks and other irregularities, greatly increases the service life of the parts.

In one fast automatic operation, Superfinishing gives these two bearing surfaces a smoothness that assures much longer life.



The textbook, "Wear and Surface Finish" covers all phases of Superfinish. Your copy is free for the asking.

No. 3-453

607

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

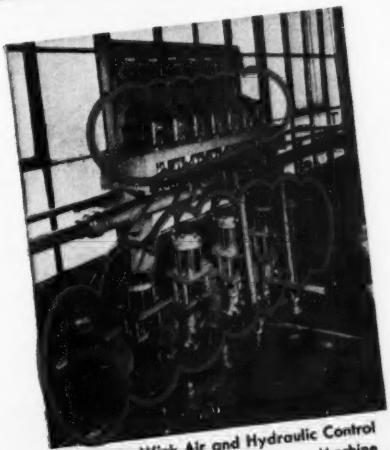
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Special Built Machine for Exacting and Thorough Hydraulic Testing Heavy Duty Gate Valves

Quick-As-Wink Control Valves

industry wide recognition for unsurpassed dependability



Quick-As-Wink Air and Hydraulic Control Valves that Operate the Testing Machine Shown Above

We think steel men know most about steel; rubber industry men know most about rubber; machine builders know most about machines; and valve men know most about valves. So when a large nationally known valve manufacturer chose Quick-As-Wink control valves for the exacting and thorough testing of his own heavy duty valves (see photo) we're pleased — but not surprised, because throughout the steel, rubber, machine building, and most other industries, men with experience usually prefer Quick-As-Wink Control Valves. Positive and fast-acting, every valve is designed and built for maximum air economy and the long, dependable trouble-free service you want in your operations.

Quick-As-Wink
AIR AND HYDRAULIC
Control Valves

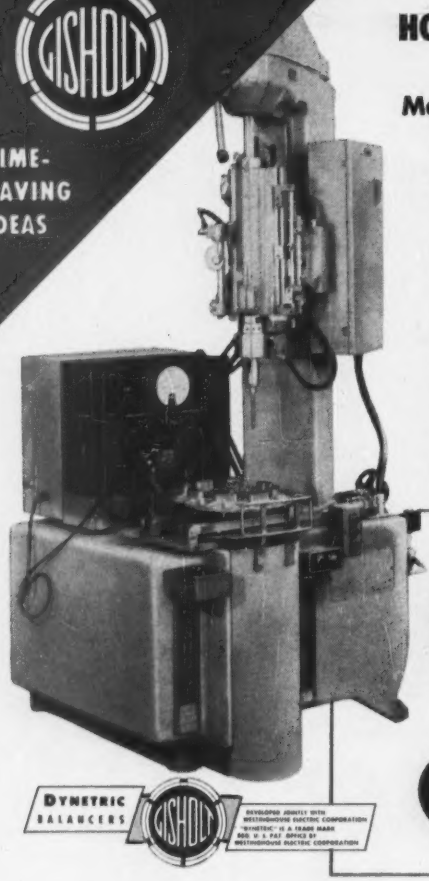
Hand, Foot, Cam, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., 1911 East Pershing St., Salem, Ohio

TIME-SAVING IDEAS

HOW BALANCING HELPS TAKE THE SHAKES OUT OF TRACTORS

Machine Measures and Corrects Unbalance in Variety of Parts



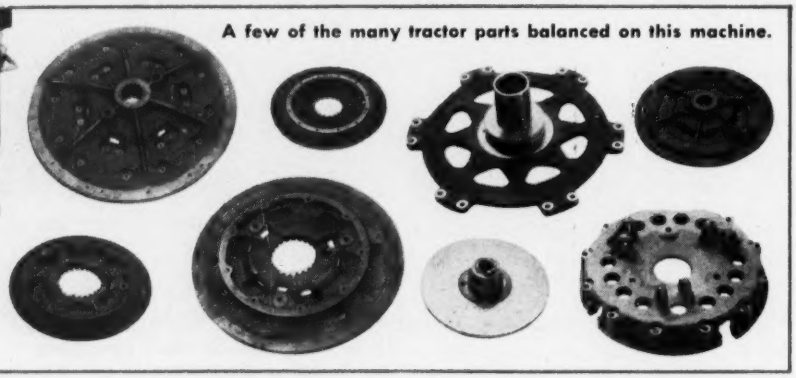
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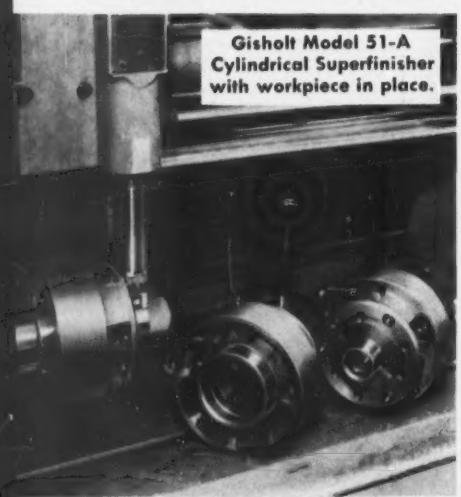
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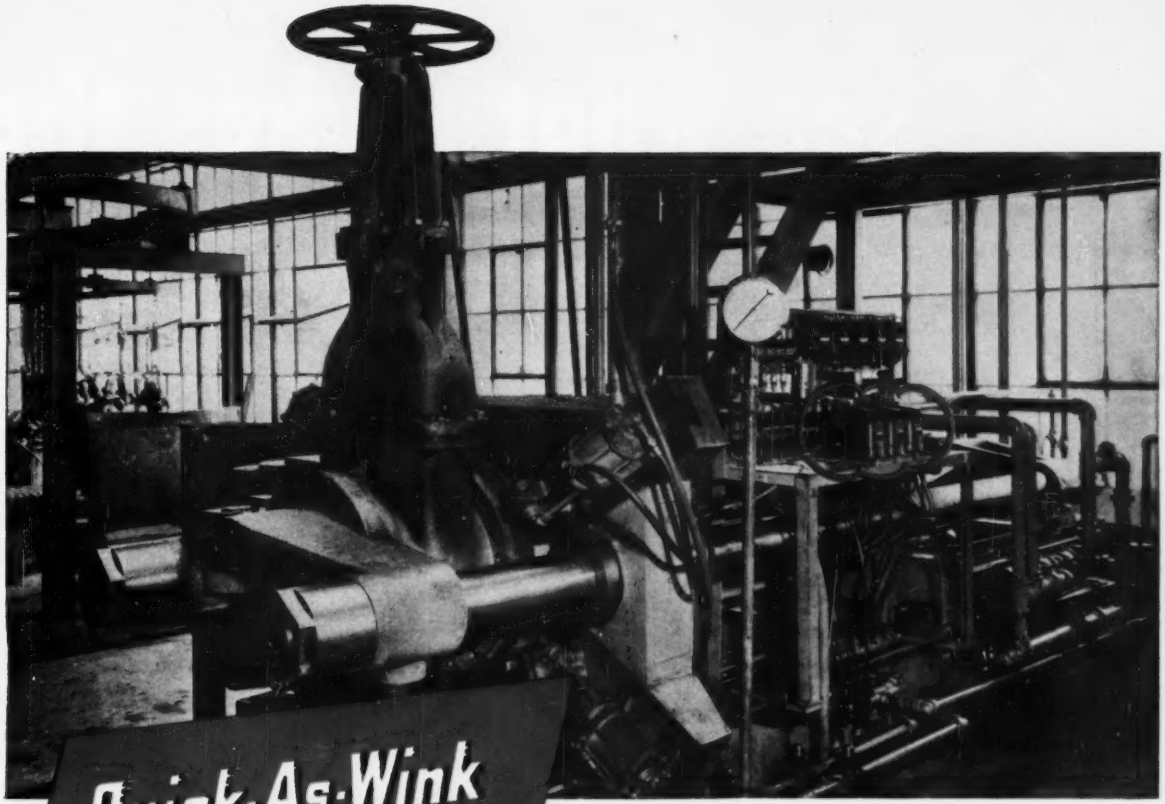
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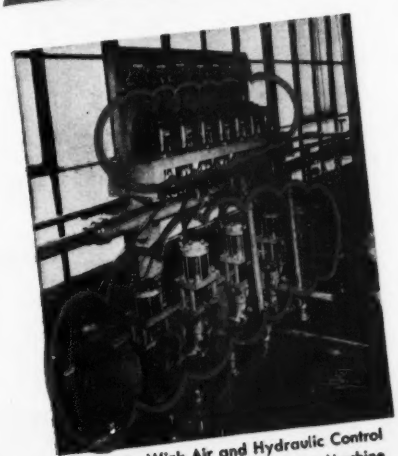
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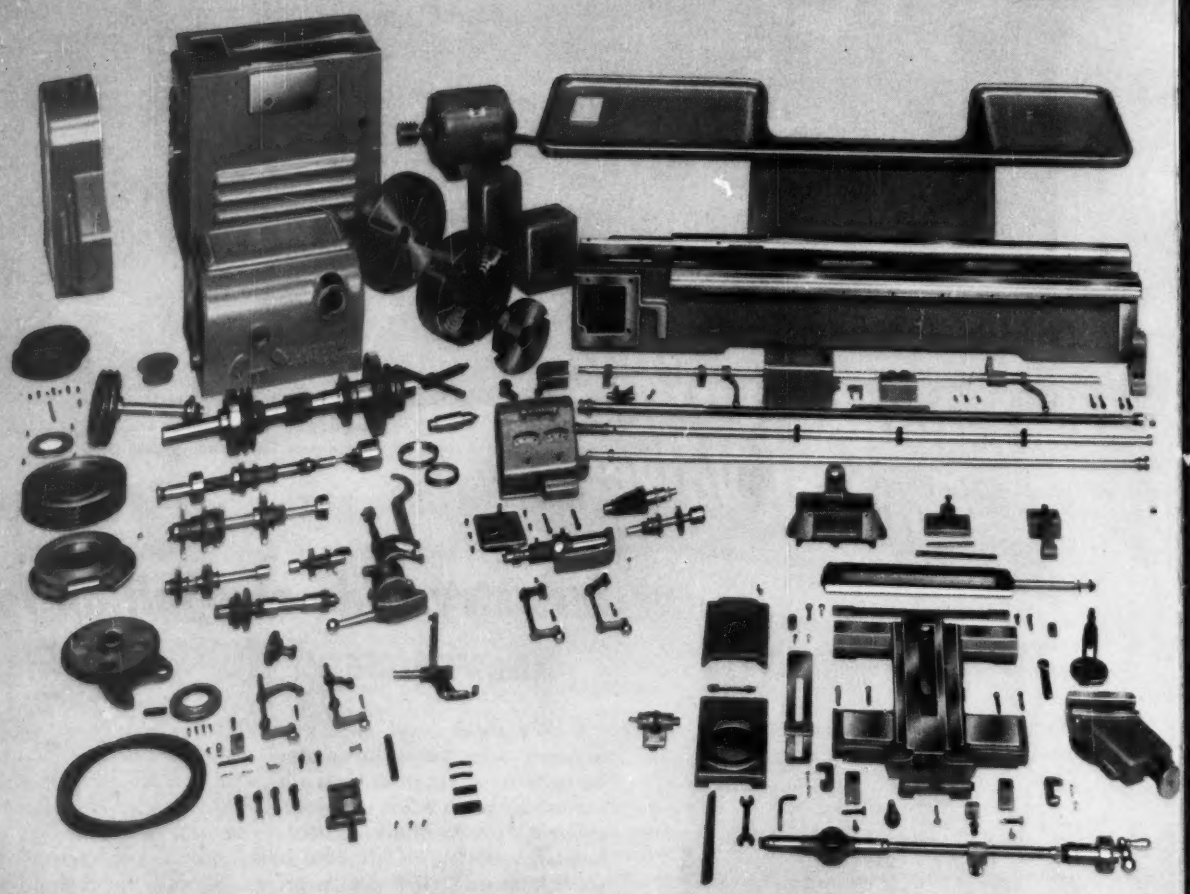
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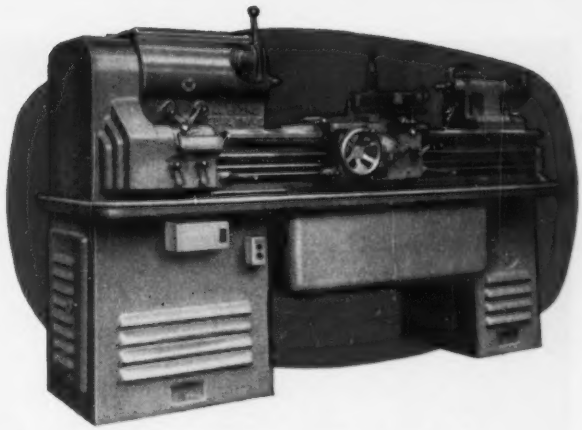
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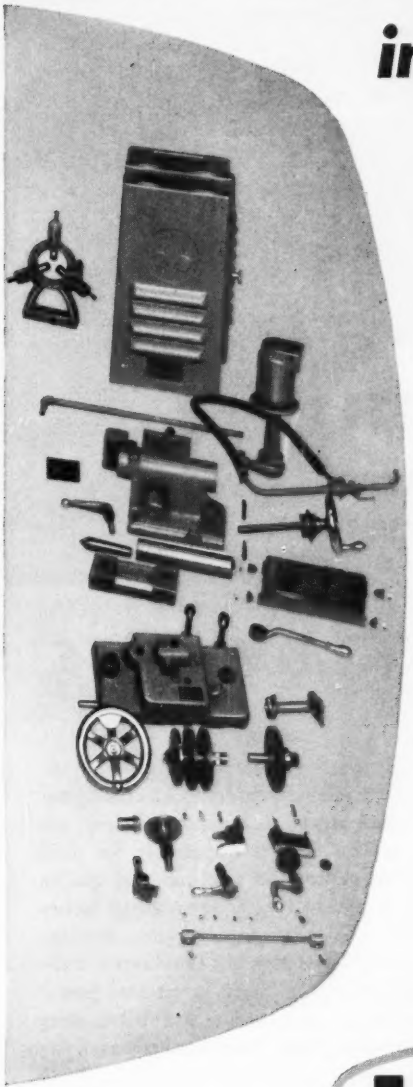


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15″ swing to take care of virtually all of your medium-duty turning. 30″ base center distance; more in increments of 12″.

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Ninety-six feeds from .0004″ to .106″.
Forty-eight threads from 4 to 224.

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Single-lever speed control. Electric brake, forward and reverse spindle control at apron. Single-lever, positive-jaw feed control. Multiple automatic length stops. Many useful attachments.

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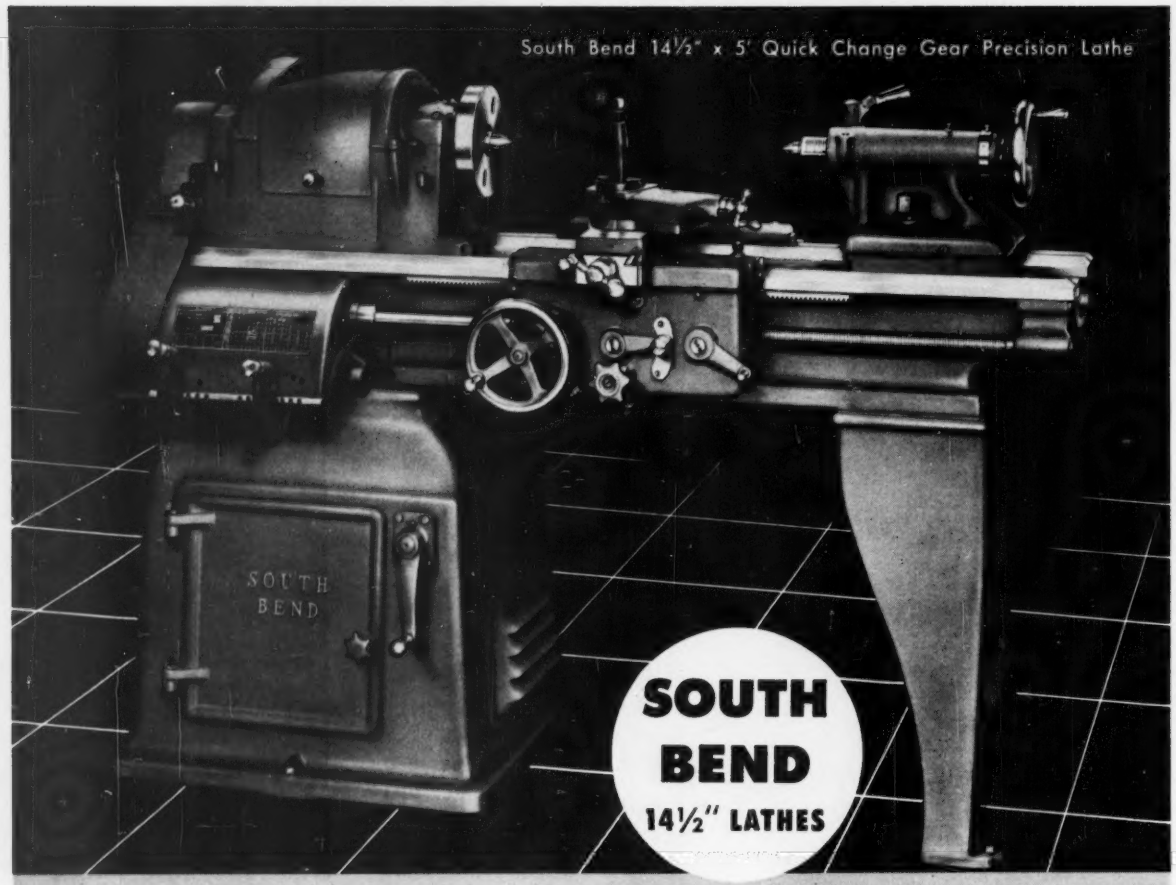
Totally-enclosed feed box. Automatic lubrication through headstock and feed box. Hardened steel gears and anti-friction bearings. One-piece, double-wall apron. Hardened and ground replaceable steel bed ways. American Standard taper key drive spindle nose.

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WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 65 YEARS*



FOR FAST, PRECISION MACHINING

SPECIFICATIONS

SWINGS: 14⅝" over bed and saddle wings; 10¼" over saddle with chip guard removed.

BED LENGTHS: 5, 6, 7 and 8 feet.

DISTANCES BETWEEN CENTERS: 24½ to 60½ inches.

MAXIMUM COLLET CAPACITY: 1 inch. (Collets interchangeable with South Bend 10"-1" Collet, 13", 16" and 16-24" Lathes.)

SPINDLE BORE: 1⅜ inches.

SPINDLE SPEEDS: Eight . . . 27 to 800 r.p.m.

POWER LONGITUDINAL FEEDS: 48 R.H. or L.H., .0015" to .0841".

POWER CROSS FEEDS: 48, .0006" to .0312".

THREAD CUTTING: 48 R.H. or L.H. pitches, 4 to 224 per inch.

CROSS SLIDE TRAVEL: 10 inches.

TAILSTOCK SET-OVER: 1-5/16 inches.

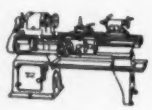
South Bend 14-1/2" Lathes offer many advantages for precision machining. Ease of operation, speed, power, accuracy, and efficiency are some of the features responsible for their popularity. Often the precision and quality of finish obtained with South Bend Lathes are such that subsequent grinding, honing, or lapping operations are unnecessary. Substantial savings in capital investment, power consumption, floor space, and labor costs have resulted from their installation.

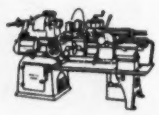
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Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

FARVAL—*Studies in Centralized Lubrication* No. 139

Farval Announces DC 20 Automatic Pumping Unit

for complete lubrication of smaller machines

NOW any small machine can have a completely automatic system of Farval centralized lubrication—as efficient and economical as the larger systems which have proved so valuable on heavy industrial equipment during the past 26 years.

Chief component of this smaller, low cost system is the new Farval DC20 pumping unit which handles either grease or oil. In addition to the pumping unit, the complete Farval system consists of two main supply lines, the familiar Dualine measuring valves and discharge line connections from measuring valves to the bearings.

Easily installed at any convenient place on or near a machine, the DC20 insures automatic delivery of lubricant to bearings, as often as needed, in whatever quantities desired, while the machine is in operation. Remember that Farval—and Farval only—employs the Dualine valve that is fully adjustable—simple, sure and foolproof—with a positive indicator which visually signals that the valve has functioned.

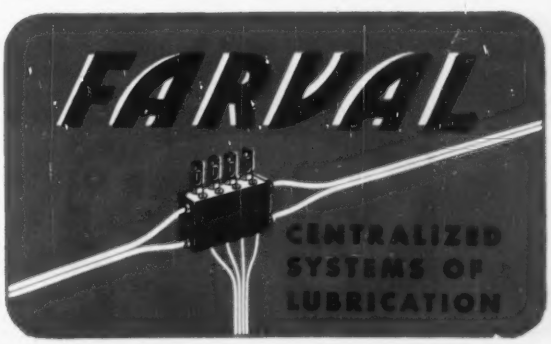
Hundreds of operators using the larger Farval automatic systems have discovered that the entire cost of a system is saved the first year. Lubricant savings alone may run as high as 75%.

Investigate the new DC20. Near you is an experienced Farval lubrication engineer who will demonstrate how the new DC20 pumping unit can save time and money and increase production on your present hand-lubricated machines. Write today for a copy of Bulletin 39, "DC20 Pumping Unit for Smaller Machines". The Farval Corporation, 3276 East 80th Street, Cleveland 4, Ohio.

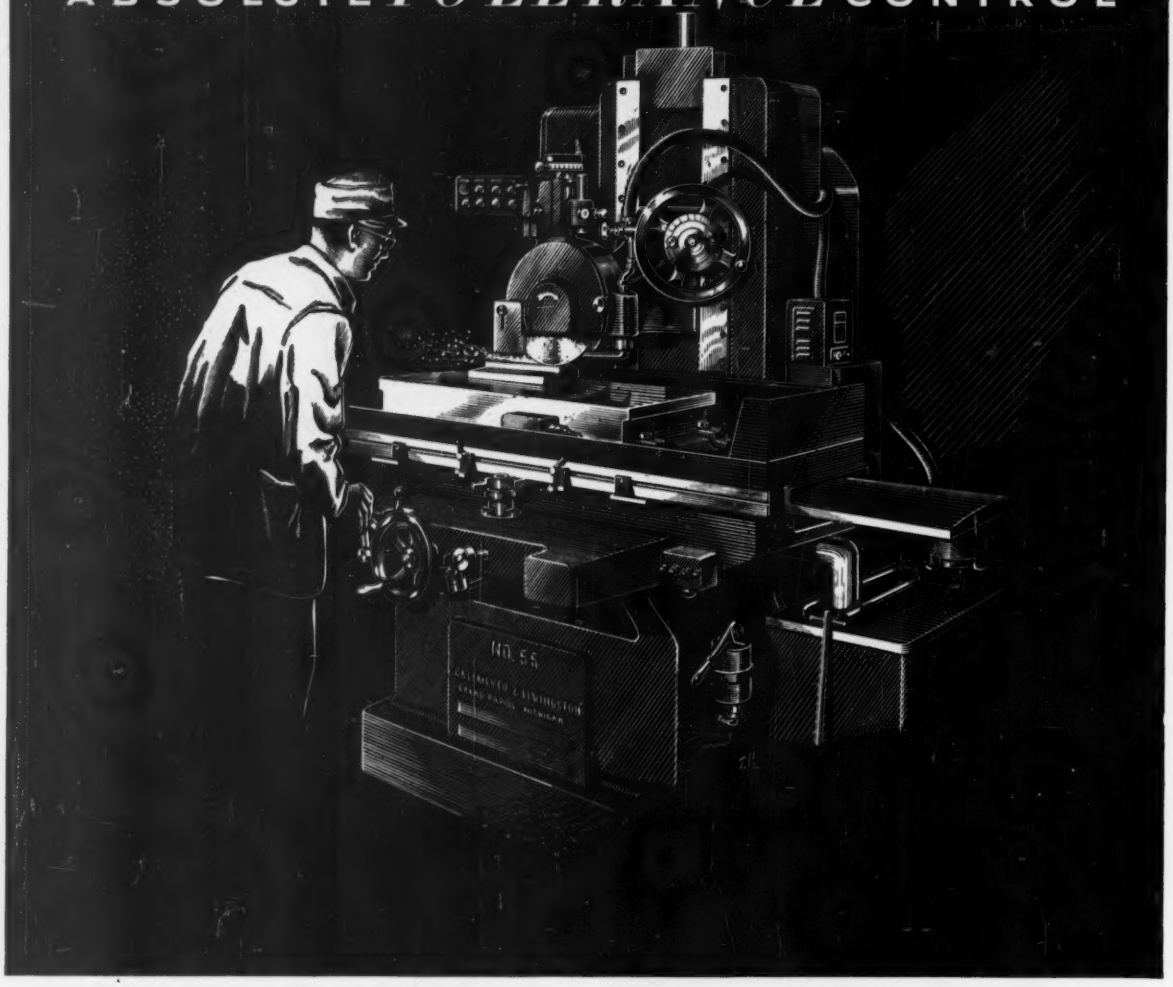
Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



ALL PARTS OF THIS NEW FARVAL DC20 *automatic pumping unit are assembled on a single base plate ready for quick, easy mounting at any convenient point. Supply lines run from the pumping station to the Dualine measuring valve manifolds, one valve for each bearing to be lubricated. The entire system is installed very simply and at a cost that will be repaid in a few months in savings effected.*



ABSOLUTE *TOLERANCE* CONTROL



When job specifications leave no leeway, when extreme tolerances must be maintained . . . that's when the built-in precision and absolute tolerance control of Grand Rapids Grinders proves most valuable. Defense commitments make it impossible for us to fill your orders as rapidly as we'd like to . . . but we know our customers can appreciate the reasons for delay. As always, we're doing our best to serve you.

GALLMEYER & LIVINGSTON CO.
305 Straight Ave., Grand Rapids, Mich.

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. . . the very best

Manufacturers of
SURFACE GRINDERS • CUTTER and TOOL GRINDERS • TAP and DRILL GRINDERS



"CATERPILLAR"

+

"American"

A coalition of outstanding "name" products dedicated to the interests of industry.

Here is a "Caterpillar" Diesel DW20 Tractor with W20 Wagon loading heavy clay for the Garza-Little Elm Dam near Lewisville, Texas.





The astonishing ease of operation of these units due to their ultra-modern design makes the "load" lighter and the cost lower.

For the very same reason "Caterpillar" uses many "American" Radials. Because of their ultra-modern design they make the drilling, boring and tapping "load" lighter in "Caterpillar" plants and keep the cost of production at a minimum.

Extra power, centralized control, boring mill type spindle and extra fast tapping are outstanding virtues of "American" Hole Wizard Radials which swell the operator's pay envelope and help keep production on a profitable plane.

For more work, better work and lower cost work, get the facts about "AMERICAN".

Bulletin No. 327 upon request.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills



Is compact design your problem?

here's how portable electric tool manufacturers solve it with **NEEDLE BEARINGS**

Torrington Needle Bearings are designed into many portable electric tools because their small cross section permits the close shaft-center distances so necessary to compactness.

They have been *performance-proved* through years of successful operation on counter shafts, pinion shafts and spindles in drills, buffers, sanders, grinders and other electric tools.

Since it was introduced nearly twenty years ago, many manufacturers throughout industry have made the Torrington Needle Bearing "standard equipment" for products requiring an anti-friction bearing that's light, compact and has high rated radial capacity.

Why not find out how Torrington Needle Bearings can be used to advantage in your products?

THE TORRINGTON COMPANY, Torrington, Conn., South Bend 21, Ind.

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers

Trade-marks of some of the portable tool companies whose products enjoy the benefits of Needle Bearings.

SKIL PORTABLE TOOLS · STANLEY · MILLERS FALLS TOOLS · SIOUX · PET POWER TOOLS · Speedmatic · Thor · Milwaukee · Black & Decker · Mall

BULLARD

MANUFACTURERS OF MACHINE TOOLS



Haylift for Starving Snow Bound Livestock — Fallon, Nevada

Wide World Photo

The Invisible Background of Industrial Progress

Few people realize the full extent of Industrial America's free enterprise and ingenuity. Modern engineering and manufacturing methods provide such planes as illustrated for air lifts in this country and abroad. Shown here is a Haylift for Starving Snow Bound Livestock at Fallon, Nevada.

Flying Box Cars are built for carrying heavier-than-usual loads and are normally used by the armed services for transporting bulky and heavy military equipment as well as personnel. These planes are capable of medium-long flights and are suited to operate under adverse weather conditions. Their ability to make small area landings and take-offs, and the speed and ease with which large heavy types of cargo are loaded and unloaded make them ideal for flights for the relief of snow bound, flood stricken and emergency areas.

In "The Invisible Background of Industrial Progress" Bullard's ★ *Modern Machine Tools* play an important part in manufacturing and the maintenance of today's air arm.

★ *For greater manufacturing economy REFER to next page*

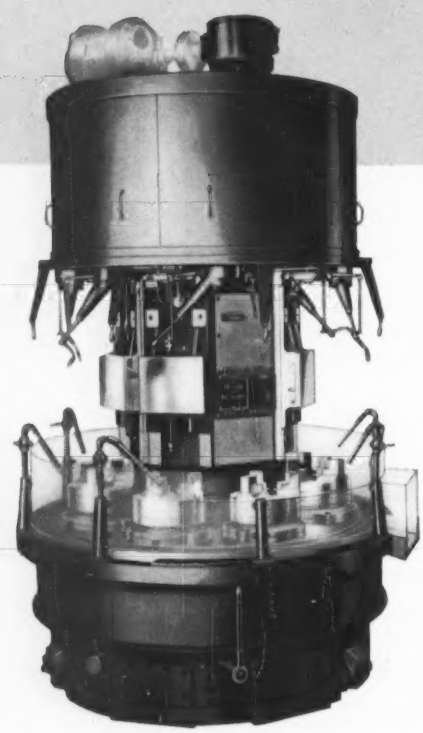
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



16"—6 spindle type "D" Mult-Au-Matic for production of aeroplane motor forged Cylinder Heads showing sixth and loading stations.



Bullard Mult-Au-Matics have become a byword in the fields of high-speed production and manufacturing economy. Built with a backbone for sustained endurance they provide an economical manufacturing method easily adaptable to many classes of work.

These machines are outstanding in the automotive industry, which includes many products such as tractors, aeroplane engines, marine motors and a host of other items. The flexibility of Mult-Au-Matic provides for change-over from one design of a part to a new design of the same part or from one part to another of different design without basic change to the machine other than tooling and versatile changes of feeds, speeds and head adjustments.

BULLARD

Time saved is money earned. Write now for information.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT



If your product involves brazing, heat-treating, forging or melting of ferrous or non-ferrous metals, similar savings of time and money can probably be uncovered in your plant, too. A TOCCO engineer is glad to survey your plant without obligation, of course.

THE OHIO CRANKSHAFT COMPANY



Mail Coupon Today

FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. M-3, Cleveland 1, Ohio

Please send free copy of "Typical Results of TOCCO Induction Brazing and Soldering."

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

STANOSTAMP

REG. U. S. PAT. OFF.

Compounds



Easy on the draw

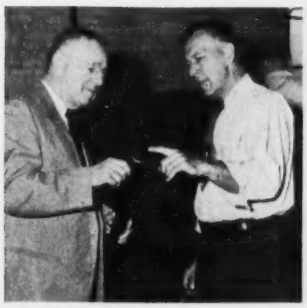
● Shown above is the drawing operation used by The Lock Joint Tube Co. in the production of automobile steering gear jackets. Two ¼-inch draws are made on steel tubing.

Dissatisfied with the performance of a conventional drawing compound on this job, operators took the advice of a Standard Oil lubrication specialist and switched to STANOSTAMP C Compound.

This product has met their needs on every count. It has proved economical to use because operators have been able to mix it with water and soluble oil and apply that mixture in light coatings to the steel tubing. STANOSTAMP C has provided better protection for dies, thus reducing wear. Draws are now made on over 2,000 pieces before dies require polishing. Although the drawn pieces are not cleaned until long after the drawing operation, there have been no rusting troubles.

Whatever your problem or need, you'll find, as did this midwest company, that a Standard Oil lubrication specialist can help you. He has a complete line of high quality cutting oils to offer and the training and practical experience to apply them most effectively. You can get his help quickly and easily by phoning your local Standard Oil Company (Indiana) office. Or write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

What's YOUR problem?



Russ Jenkins (left), lubrication specialist in Standard Oil's South Bend office, helped the superintendent of this midwest plant improve a drawing operation through the use of a STANOSTAMP Compound.

Mr. Jenkins is one of a corps of able lubrication specialists who are located in Standard offices throughout the Midwest. These men have been specially trained in Standard Oil Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert, and thorough attention to your lubrication problems.

It's easy to obtain his services. A phone call to your nearest Standard Oil Company office will bring him quickly to your plant . . . with no obligation to you, of course.



Spells "finish" for another cutting problem. A midwest manufacturer wanted better finish on steel valve seats. STANICUT Cutting Oil 117 BCS replaced a more expensive product on this screw machine job and produced the desired finish. It also extended tool life, resulting in lower tool cost and fewer tool changes.

Solution for a hard water problem. SUPERLA Soluble Oil has helped the U. S. Machine Corporation, Lebanon, Indiana, overcome a hard water problem. Mixed with the hard water used in the plant, SUPERLA Soluble Oil has given excellent results on jobs calling for the machining of cast iron. There has been no spoilage of the work due to rusting. Tool life has been highly satisfactory. Clean operation and freedom from odor development have provided desirable working conditions for machine operators.



STANDARD

STANDARD OIL COMPANY
(INDIANA)

ARMSTRONG

Quality TOOLS



NOT A COST, BUT AN INVESTMENT

That Pays Year After Year . . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world-wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.



ARMSTRONG Quality pays back over and over again. *Write for our catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.



Fellows is known by the company it keeps

The Fellows Gear Shaper Co., Springfield, Vt. is universally known for building top quality products . . . using advanced methods and the most modern equipment. Fellows' modern machinery includes this new GRAY 48" x 48" x 16' Milling Machine, which is ideally suited to their fast, high production requirements. GRAY's modern speeds are demonstrating in hundreds of shops, that jobs don't grow old on a GRAY!

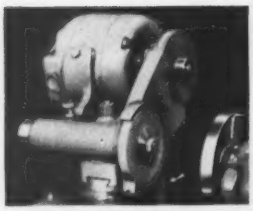
GRAY self-contained Unit Heads permit high horsepower cuts with speeds from 10 to 1000 instantly available by the flick of a lever.
Large facing cutters and small end mills can be run simultaneously at efficient speeds and at high feeds on a GRAY.

Write today ● get the story on **HIGH** low cost **PRODUCTION**

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES



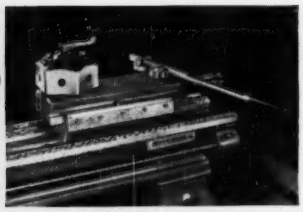
External Grinder



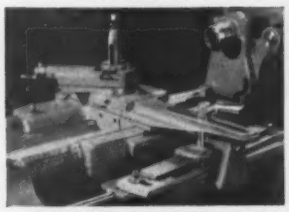
Milling Attachment



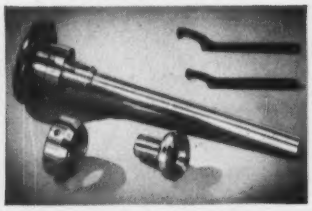
Handlever Tailstock



Handlever Bed Turret



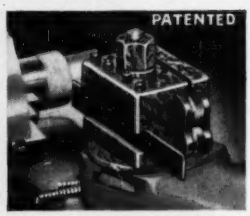
Telescopic Taper Attachment



Handwheel Collet Attachment



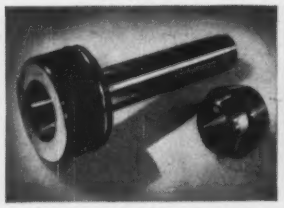
Handlever Collet Attachment



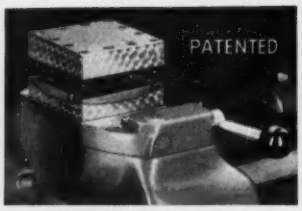
10 in 1 Tool Holder



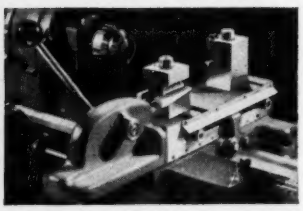
Ball Bearing Live Center



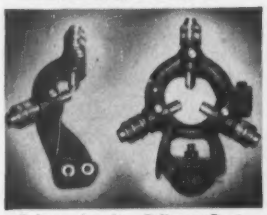
Adjustable Collet Bushing Chuck



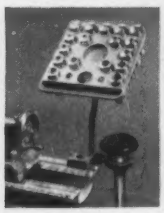
Square Turret Tool Block



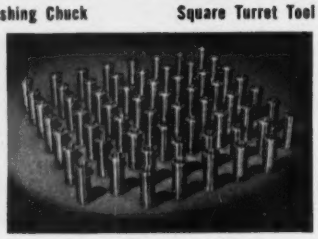
Handlever Double Tool Cross Slide



Telescoping Jaw Follower Rest and Center Rest



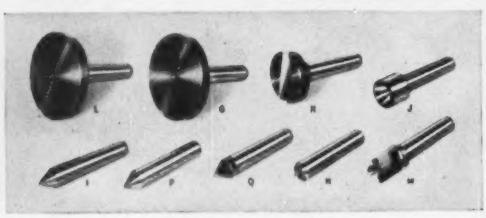
Collet Rack



Steel and Brass Collets



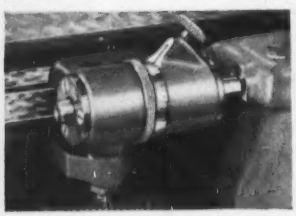
Step Chucks and Closers



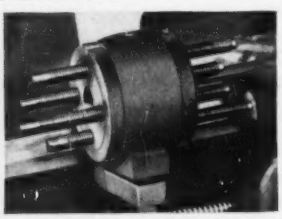
Centers and Drill Pads



Thread Dial Indicator



Micrometer Carriage Stop



Four Position Carriage Stop

SOUTH BEND

Lathe Attachments

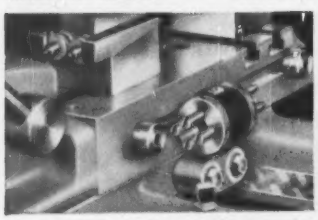
- Cut Production Time
- Simplify Difficult Jobs
- Increase Lathe Versatility
- Speed Up Tooling
- Perform Special Classes of Work
- Reduce Operator Fatigue

Write for Catalog 5102

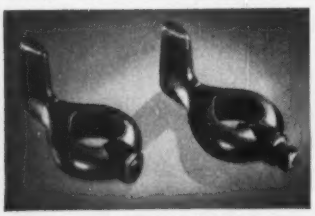
SOUTH BEND LATHE

Building Better Tools Since 1906

SOUTH BEND 22, INDIANA



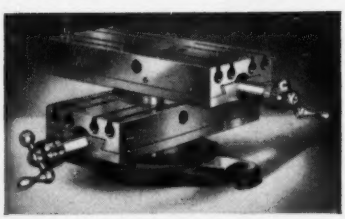
Four Position Cross Slide Stop



Safety and Standard Lathe Dogs



Coolant Pump



Universal Table

"Sinclair Autokut® PT provides Better Finish"

... says Ralph Ragan, President, Ragan Ring Company



The Textile Rings that the Ragan Ring Company of Atlanta, Ga., manufactures must have the best surface finish possible to insure uniform yarn production at extremely high speeds.

To make these rings from very hard, cold drawn seamless tubing, Ragan Ring uses Sinclair AUTOKUT PT oil.

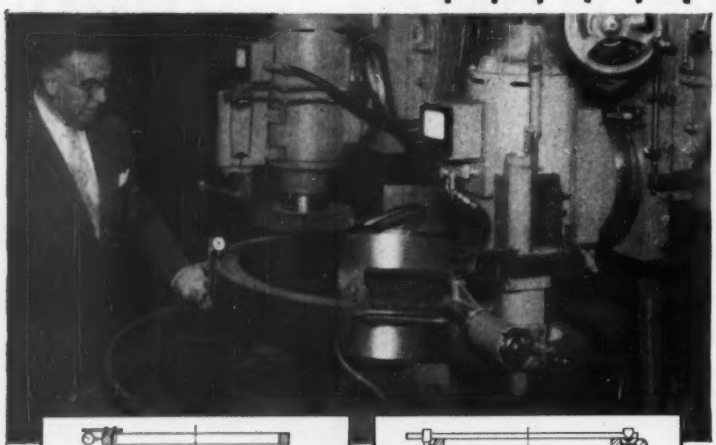
President Ralph Ragan says, "After having tried various combinations of cutting compounds, we found that AUTOKUT PT provides better finish of rings and longer tool life, and therefore, better economy.

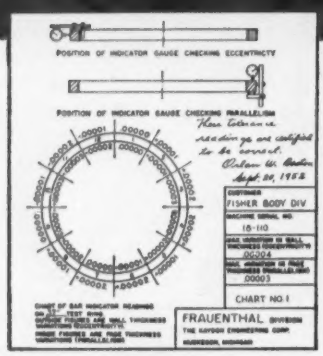
"It's one of the best we have used . . . and I personally recommend it without qualifications."

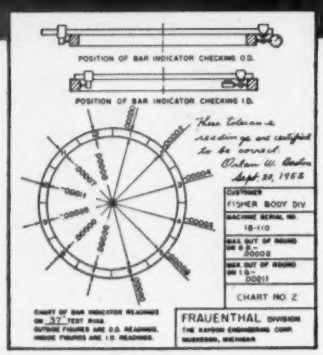
Perhaps a Sinclair Lubrication Engineer can help you with your metal cutting problems. Call your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR CUTTING OILS and COOLANTS
for metal working

GRINDING TO millionths* OF AN INCH







* *Our normal method of expressing tolerances in tenths-of-thousandths of an inch became inadequate when precision was attained to fractions of tenths-of-thousandths, expressed best in MILLIONTHS of an inch.*

Utmost precision proved by meticulous tests, and certified by Orlan W. Boston, Chairman, Department of Production Engineering, University of Michigan. He witnessed tests at Frauenthal plant in Muskegon and certified their validity on precision grinding of a 37-inch test ring, on Frauenthal Grinder No. 18-110 (shipped to Fisher Body Division for grinding tank bearings).

You get TOP PRECISION with Frauenthal Grinders

The certified readings listed at left are much closer than the 200-millionths of an inch precision specified for these machines. You can get similar results on other sizes of Frauenthal Multiple-Head Super-Precision Cylindrical Grinders, up to 140-inch diameter grinding on the Series 2200 machines. Uniformity of precision is assured in concentricity, parallelism and roundness. You can make many combination settings of grinding-spindle positions for a wide variety of simultaneous grindings of outside, inside and faces. Details on request.

PRECISION GAUGE READINGS • CHART NO. 1

MAX. VAR. IN FACE THICKNESS (Parallelism)				MAX. VAR. IN WALL THICKNESS (Eccentricity)			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	7	.000000"	1	.000000"	7	+.000020"
2	+.000010"	8	+.000020"	2	+.000010"	8	+000010"
3	+.000030"	9	+.000030"	3	+.000020"	9	.000000"
4	+.000030"	10	+.000030"	4	+.000020"	10	−.000010"
5	+.000030"	11	+.000030"	5	+.000010"	11	−.000020"
6	+.000010"	12	+.000020"	6	+000020"	12	−.000010"

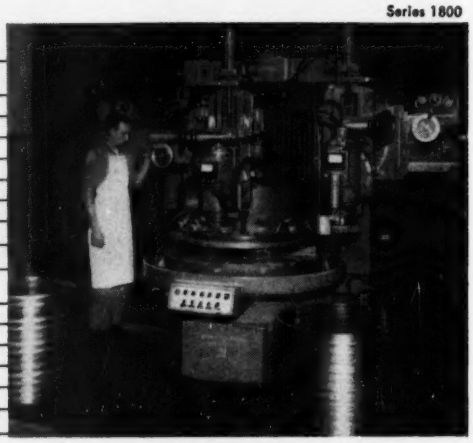
Maximum Variation in Parallelism: .000030" Maximum Variation in Eccentricity: .000040"

PRECISION GAUGE READINGS • CHART NO. 2

MAX. OUT-OF-ROUND ON O. D.				MAX. OUT-OF-ROUND ON I. D.			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	4	−.000050"	7	.000000"	10	−.000110"
2	−.000020"	5	−.000080"	8	.000000"	11	−.000070"
3	−.000040"	6	.000000"	9	−.000050"	12	.000000"

Maximum Variation, Outside Diam: .000080" Maximum Variation, Inside Diam: .000110"

Series 1800



What is YOUR Grinding Problem?

Through more than a decade of toolroom and production grinding, Frauenthal Grinders have been performance-proved on tough precision jobs, such as helicopters, jet engines, army and navy tanks and gunmounts, Diesel engines, machine tools, 120-inch diameter KAYDON precision bearings and similar products. We'll be glad to work with you on difficult grinding problems.

made in 10 standard sizes . . . conforming to essential J.I.C. specifications

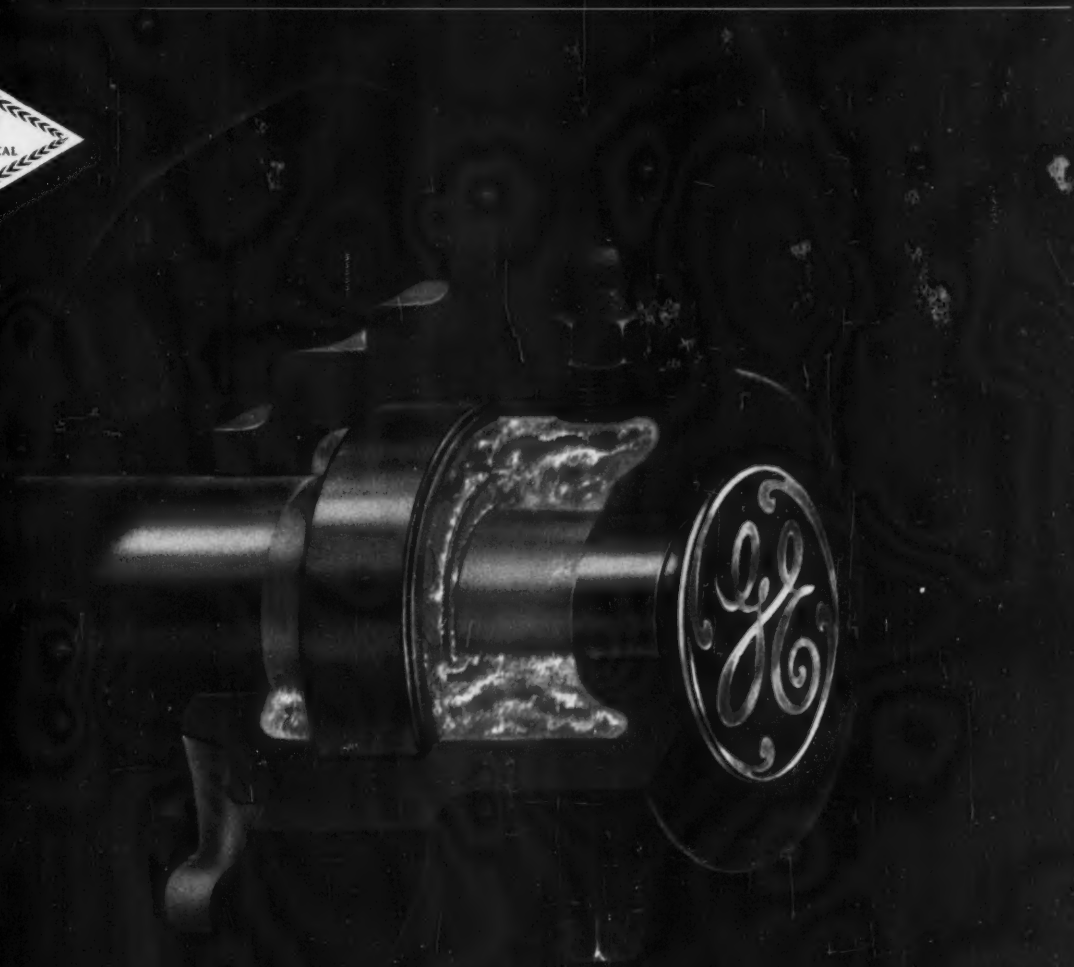
	Series 1800				Series 2000		Series 2200			
Table sizes	30"	36"	42"	48"	60"	72"	110"	120"	130"	140"
Maximum Swing	56"	56"	56"	56"	72"	88"	120"	130"	140"	150"

Ask for Bulletin

Frauenthal Division THE KAYDON ENGINEERING CORP., MUSKEGON, MICH.

PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY

1878 75 1953
YEARS OF ELECTRICAL PROGRESS



These bearings last longer than life . . . grease life

G-E TRI/CLAD MOTORS LAST LONGER

REG. U.S. PAT. OFF.

ALL GREASE LIFE IS LIMITED. The best known greases dry out in time. This may be six months, seven years, or longer, depending on motor application.

SOME MOTORS ARE USELESS WHEN GREASE DRIES OUT. They can't be regreased, you lose production time . . . because your maintenance man is "sealed out."

BUT GREASE LIFE NEED NOT LIMIT MOTOR LIFE. Tri-Clad motors give long life without relubrication, plus provision for adding new grease when necessary.

ADDED GREASE IS USEFUL GREASE. Relubrication puts fresh grease in storage in bearing housing . . . as motor operates, grease oils migrate to bearing as needed.

TRI-CLAD MOTOR BEARING IS EASIEST TO REGREASE. Do it on the job, with motor running . . . no dismantling . . . no trip to a service shop.

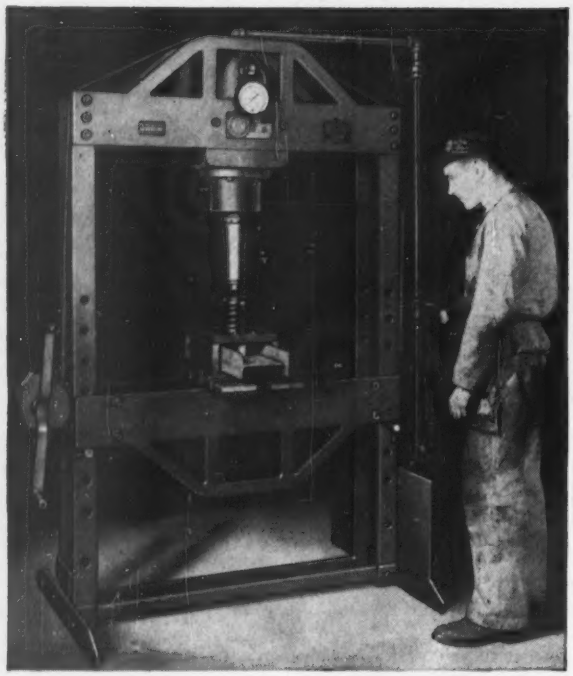
TRI-CLAD MOTOR BEARING IS BETTER PROTECTED. Completely enclosed housing has *longer seals* to keep dirt out, *larger grease supply*, and *scientific design* for continual grease migration.

THIS PRACTICAL BEARING DESIGN is one more reason why G-E Tri-Clad motors give better service . . . added life. Order through your nearby G-E Apparatus Sales Office or authorized G-E agent or distributor. General Electric Company, Schenectady 5, N. Y.

752-18

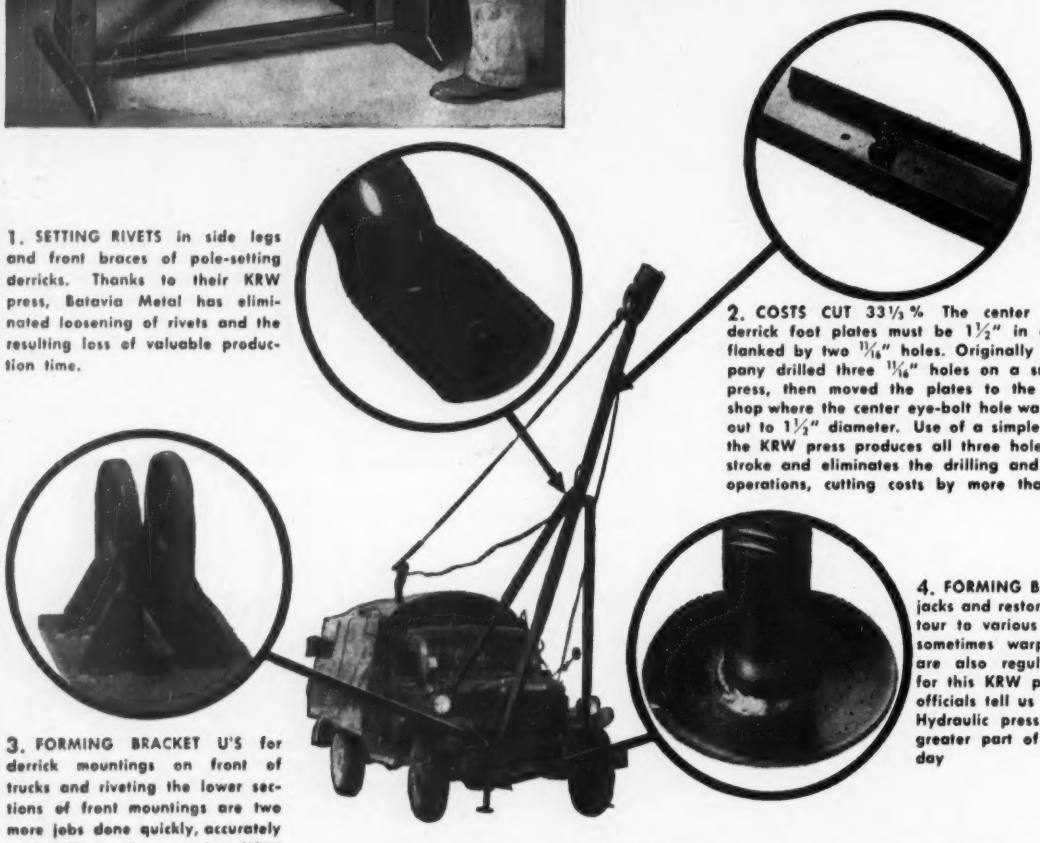
You can put your confidence in—

GENERAL ELECTRIC



KRW HYDRAULIC PRESS DOES 4 VITAL JOBS ON POLE-SETTING DERRICKS

BATAVIA METAL CORP. bought a K. R. Wilson 75 ton motor-driven Hydraulic Press two years ago to perform a few routine operations on their pole-setting derricks (derrick shown on telephone truck below). But they soon found that the amazing versatility of the press—the ease and speed with which it can be converted from one set-up to another, makes it a natural for all kinds of trouble shooting. Below are just a few of the jobs their KRW press does.



1. SETTING RIVETS in side legs and front braces of pole-setting derricks. Thanks to their KRW press, Batavia Metal has eliminated loosening of rivets and the resulting loss of valuable production time.

2. COSTS CUT 33⅓% The center hole on derrick foot plates must be 1½" in diameter, flanked by two 11/16" holes. Originally the company drilled three 11/16" holes on a small drill press, then moved the plates to the machine shop where the center eye-bolt hole was reamed out to 1½" diameter. Use of a simple die plus the KRW press produces all three holes in one stroke and eliminates the drilling and reaming operations, cutting costs by more than ⅓.

3. FORMING BRACKET U'S for derrick mountings on front of trucks and riveting the lower sections of front mountings are two more jobs done quickly, accurately and efficiently on the KRW Hydraulic Press.

4. FORMING BASES for rachet jacks and restoring proper contour to various castings which sometimes warp as they cool are also regular assignments for this KRW press. Company officials tell us that their KRW Hydraulic press is in use the greater part of every working day

Any pressing problems in your plant? Check with K. R. Wilson for the right press to do the job. KRW Hydraulic Presses come in one, two and three cylinder models; 25 to 150 ton capacities; hand operated, air operated or motor driven. For facts and prices contact your machinery dealer or write, wire or phone Dep't. 15.

***IMMEDIATE DELIVERY** on type of press shown above up to 75 ton capacity, hand, air or motor driven.*

K. R. WILSON

215 MAIN STREET BUFFALO 3, N. Y.

DESIGNERS AND BUILDERS OF HYDRAULIC PRESSES TO SOLVE ANY METALWORKING PROBLEMS



Stop using "CUT and TRY" methods!

Guarantee your finish and size with a

RIVETT 918 Steelway Cabinet Lathe

FEATURES for more precision work

- **Instant selection of 90 to 3750 R.P.M. cutting speeds with convenient control and dial indication.**
- **Self-aligning slide rest automatically squares itself with line of centers.**
- **Double bevel steel ways, precision ground, provide positive centering action.**
- **Collets, with spacing of bearings doubled, have greater precision and gripping power.**
- **Lever chuck closer may be furnished with "one motion" control for collet, spindle drive and brake.**

Snug up to a Rivett 918 and with confidence turn, face or bore to your exacting tolerance—thrill with the knowledge that you are duplicating parts within tenths.

The speed range and tool rigidity combined with the inherent precision of the 918 assures finish and size—perfect for second operations and toolroom work.

Use a lathe consistent in size with the work to be done—save on the initial expense and continue to save with each piece produced with less effort and without rejection.

Write for bulletin 9185L. Proof of what the 918 will do for you is shown in this 20 page book.

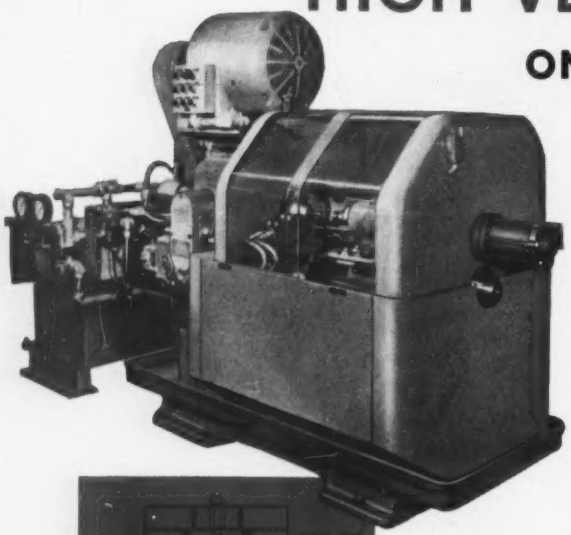


RIVETT LATHE & GRINDER, Inc.

Dept. MR3 Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

AUTOMATICITY BACKS UP HIGH VELOCITY TURNING ON FAY AUTOMATICS

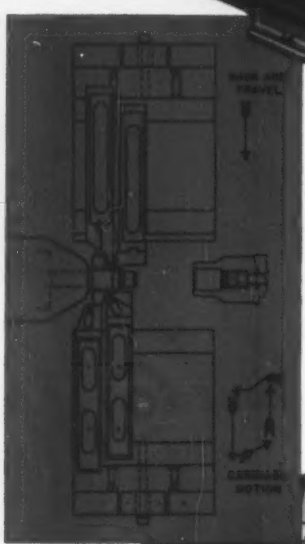


SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

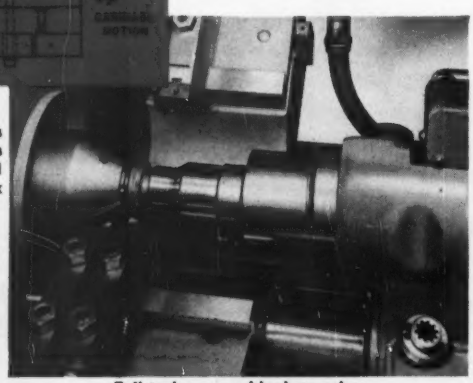
Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.

Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

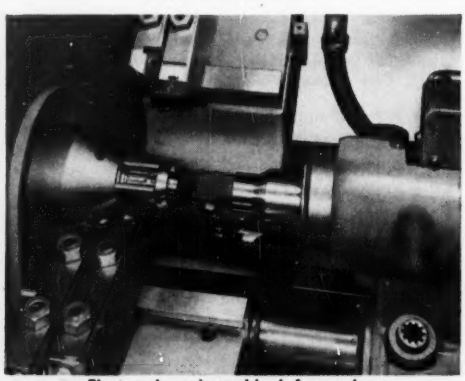
The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.



FIRST OPERATION: Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



Ejector pins release blank from arbor

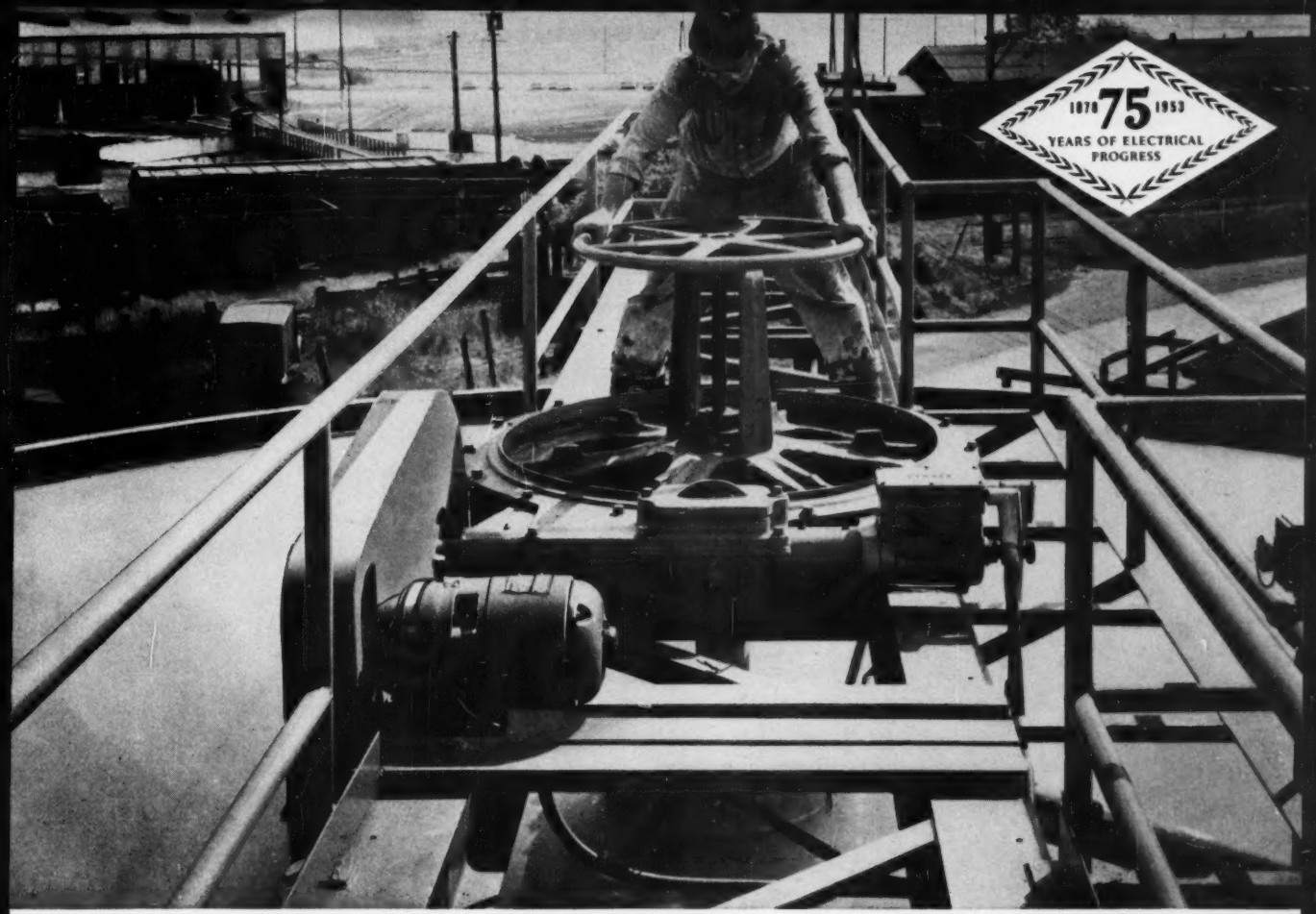
Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

FAY LATHE DIVISION



THIS G-E GEAR-MOTOR WAS PICKED TO RUN A SLUDGE ACCUMULATOR 24 HOURS A DAY AND 7 DAYS A WEEK BECAUSE . . .

New G-E Gear-motor Reduces "Down-time"

Easy stator removal, use of Tri-Clad* motors, cuts maintenance costs and time more than 50%.

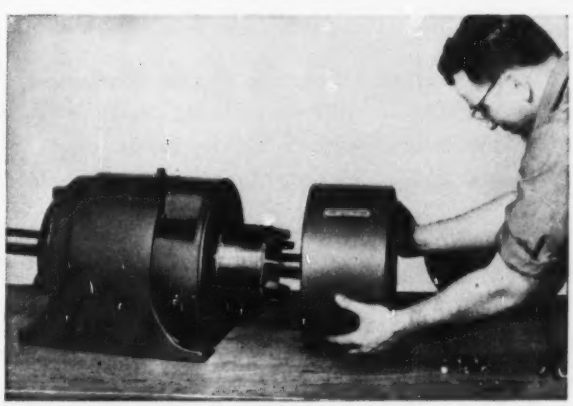
G-E Gear-motors are single units—compact and efficient—the most economical method of gear reduction for low-speed drives. This year, they have been redesigned to offer you additional operating economy.

EASY STATOR REMOVAL is now possible without disturbing the gear-train in any way. Also, any standard G-E motor—with or without feet—may be used as a stator replacement. These advantages mean a reduction of non-productive "down-time"—and substantial cost savings!

TRI-CLAD MOTORS are now an integral part of every G-E Gear-motor. These are the same motors which have gained such a wide acceptance throughout industry—the motors which assure you of extra reliability—triple protection against physical damage, electrical breakdown, and operating wear and tear.

A new stocking plan keeps most popular ratings available on a 1-week basis. You can order your gear-motor from your nearest G-E Apparatus Sales Office or your Authorized G-E Agent or Distributor. General Electric Company, Schenectady 5, N. Y. 735-10

Registered Trade-mark of General Electric Company



Rabbet fit between stator and gear-motor frame assures positive realignment. Note that stator removal is simply a matter of removing a few bolts—can be done without disturbing gear-train.

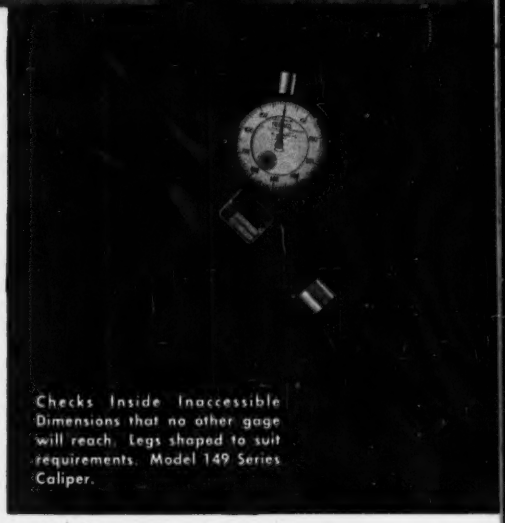
GENERAL ELECTRIC



WHETHER A HOLE IS DEEP OR SHALLOW, narrow or wide, whether it's difficult to get at, recessed or irregular, there's a Federal Indicator Gage to check it conveniently, and to precisely the dimension limits you require. We will gladly recommend the proper hole gage for your work.

Federal Indicating Gages — air, mechanical, electronic, electrical — are also available for checking all other types of dimensions, inside or outside. Let us know your requirements. Federal Products Corporation, Providence 1, R. I.

Full Color with Sound Film "Gaging for Profit" available upon request. Write for reservation.



Checks Inside Inaccessible Dimensions that no other gage will reach. Legs shaped to suit requirements. Model 149 Series Caliper.

And remember...
the Federal DIMENSIONAIR Air Gage also checks holes.

FEDERAL

LARGEST MANUFACTURER DEVOTED EXCLUSIVELY TO DESIGNING AND MANUFACTURING ALL TYPES OF DIMENSIONAL INDICATING GAGES

the hole condition...

THERE'S A FEDERAL INDICATOR GAGE TO CHECK IT!



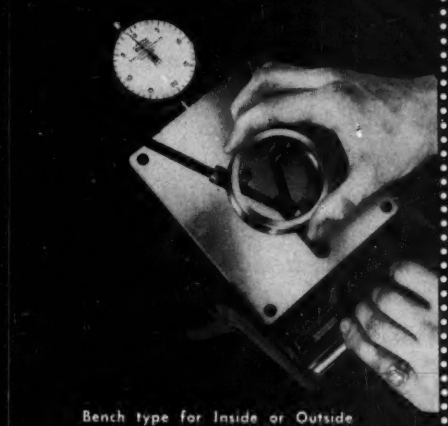
Sensitive Accuracy for Inside Diameters from .122" up. Models 1201, 1203 and 1204 Series.



For Shallow Holes, and Outside Shallow Diameters. Models 167 and 236 Series.



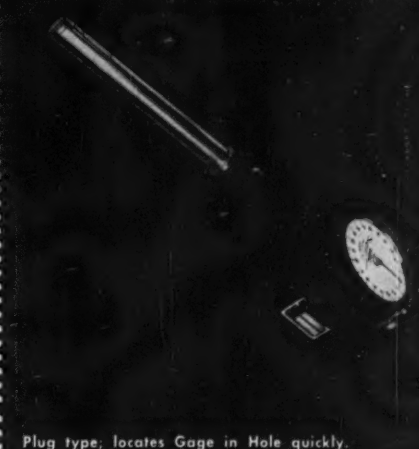
For Longer Ranges and for Holes having *larger* Inside Holes or Recesses. Models 1242 and 1243 Series.



Bench type for Inside or Outside Diameters (Two or three-point contact). Model 36 B-6 Comparator.



Portable Gage checks Bottom Diameters of Shallow Holes (Three-point contact). Model 36 P-18.



Plug type; locates Gage in Hole quickly. Inspects Small Holes from $\frac{3}{16}$" up. Model 165.



FEDERAL PRODUCTS CORPORATION

1113 EDDY STREET, PROVIDENCE 1, RHODE ISLAND

Please send me information about the following:

☐ Sketch ☐ Blueprint is enclosed showing dimension we wish to gage.

☐ Model 1201, 3 & 4 Types	☐ Model 1242, Two-Point Type	☐ Model 36 B-6 Comparator
☐ Model 167 I.D. Type	☐ Model 1243, Three-Point Type	☐ Model 36 P-18 Portable
☐ Model 236 O.D. Type	☐ Model 149 Caliper Type	☐ Model 165 Plug Type

NAME.....

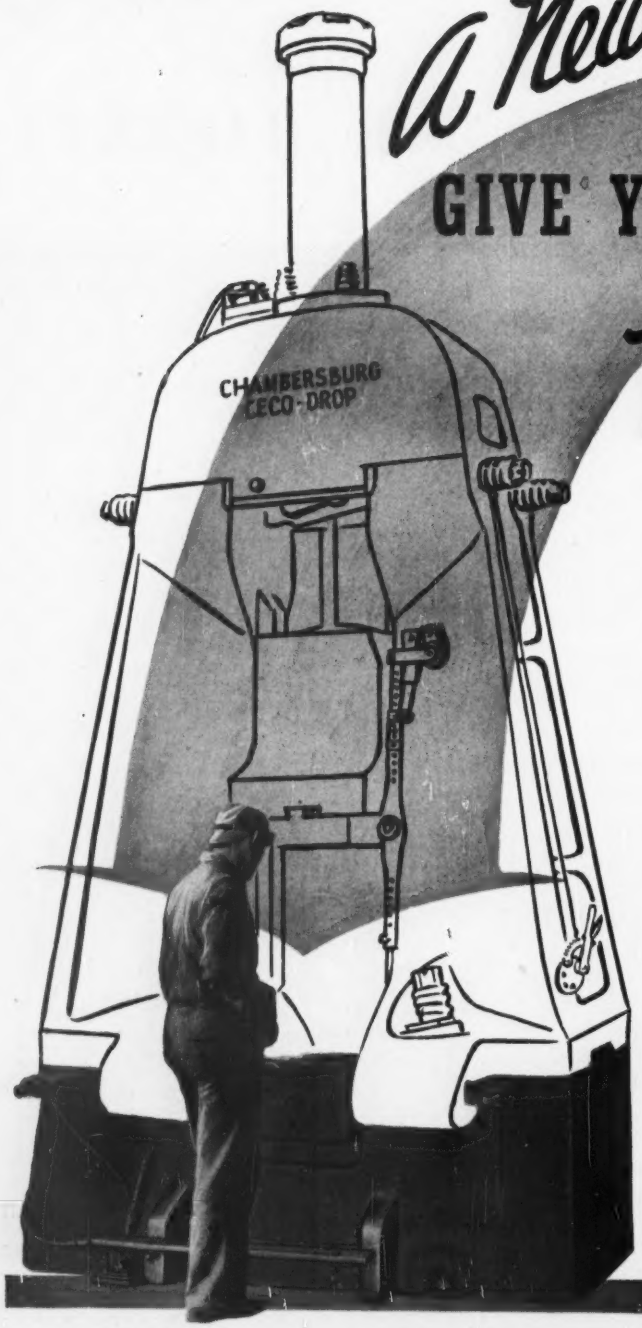
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GIVE YOUR BOARD DROP HAMMERS *a New lift!*

GIVE YOUR OPERATORS *New life!*



YOUR PRESENT ANVILS PLUS CECO-DROP UPPERWORKS

can mean quick modernization at a minimum cost and can put new life in your operators

Here's a good suggestion: You can install Ceco-Drop upperworks on your existing board drop hammer anvils. Thus at a considerable saving you will be in a position to meet and beat tomorrow's stiff competition. You will produce more accurate forgings at a lower cost through more continuous production. You will have the most modern forging hammers available. Your hammermen will end their shifts fresh and still full of pep.

That's part of the Ceco-Drop story. The rest is in Bulletin 11-L-O a copy of which will be sent on request. Write today.

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

CHAMBERSBURG

THE HAMMER BUILDERS

automatic performance reduces costs

even on **SHORT RUN** *jobs like this*



A MOTOR MANUFACTURER who made this commutator sleeve, and similar components, in lots of 300 to 800 and in several sizes, said *"on a modern type, hand-operated turret lathe our net output varied from 2½ to 3 pieces per hour, depending upon conditions"*.

Present output on his new Acme-Gridley Model M Single Spindle Automatic has more than doubled, as the job facts reveal. Much of this increase is due to Model M design features which avoid those so-called "conditions". Most important among these features is. . .

—fully automatic performance which guarantees a controlled cycle time and uniform precision—piece after piece

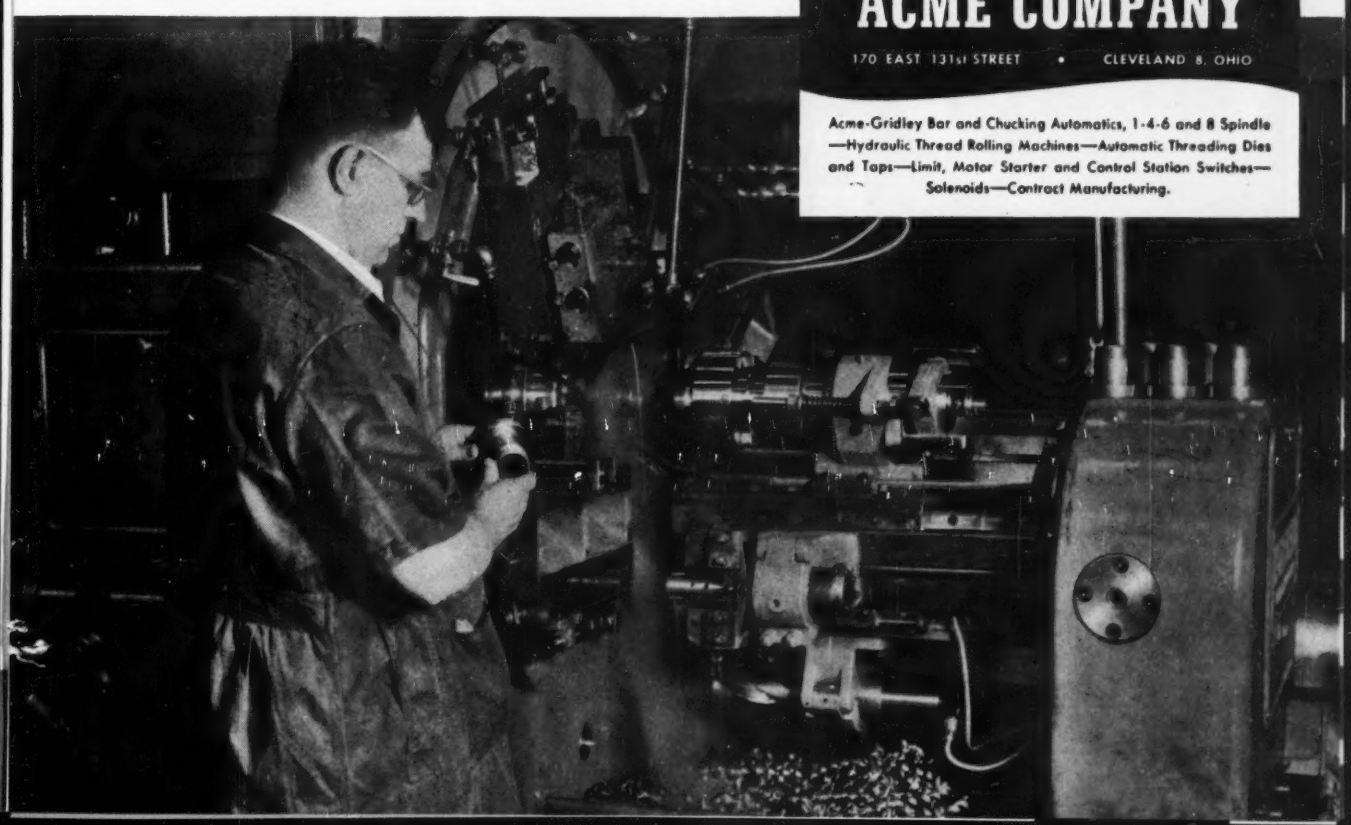
In other shops, these newest Acme-Gridley Single Spindle Bar Automatics, on hundreds of small and large lot jobs, are *2 to 10 times faster than the machines they replaced.* Ask for Catalog M-50A—better still, ask us to quote.

JOB FACTS:

Part: Commutator Sleeve
Size: 3⅜" dia. 2¾" long
Material: C-1030 Steel
Machine Time: on Acme-Gridley 3½" Model M Single Spindle Automatic—10½ minutes.
Operations: 11, including rough and finish trepan on O.D. of flange for smooth finish, reaming hole for close concentricity and threading with automatic Vers-o-tool to class 3 fit.
Former Time: on current model hand operated turret lathe—20 to 25 minutes.

Other Model M time and cost reducing advantages are—

- Eight independently operated tool slides and three automatic spindle speed ranges selective to suit each cut, whether for use of carbide or high speed tools.
- Turret indexes in 1 second and its independent tool slides provide for overlapping operations such as several short end cuts while the heavy cuts are continued from the side slides.
- The Model M also features standard cams, interchangeable spindle speed and feed change gears, and wide open tooling zone—all quickly accessible. So the set up time for changing jobs to secure fully automatic performance on similar work does not exceed that of the hand operated lathe.

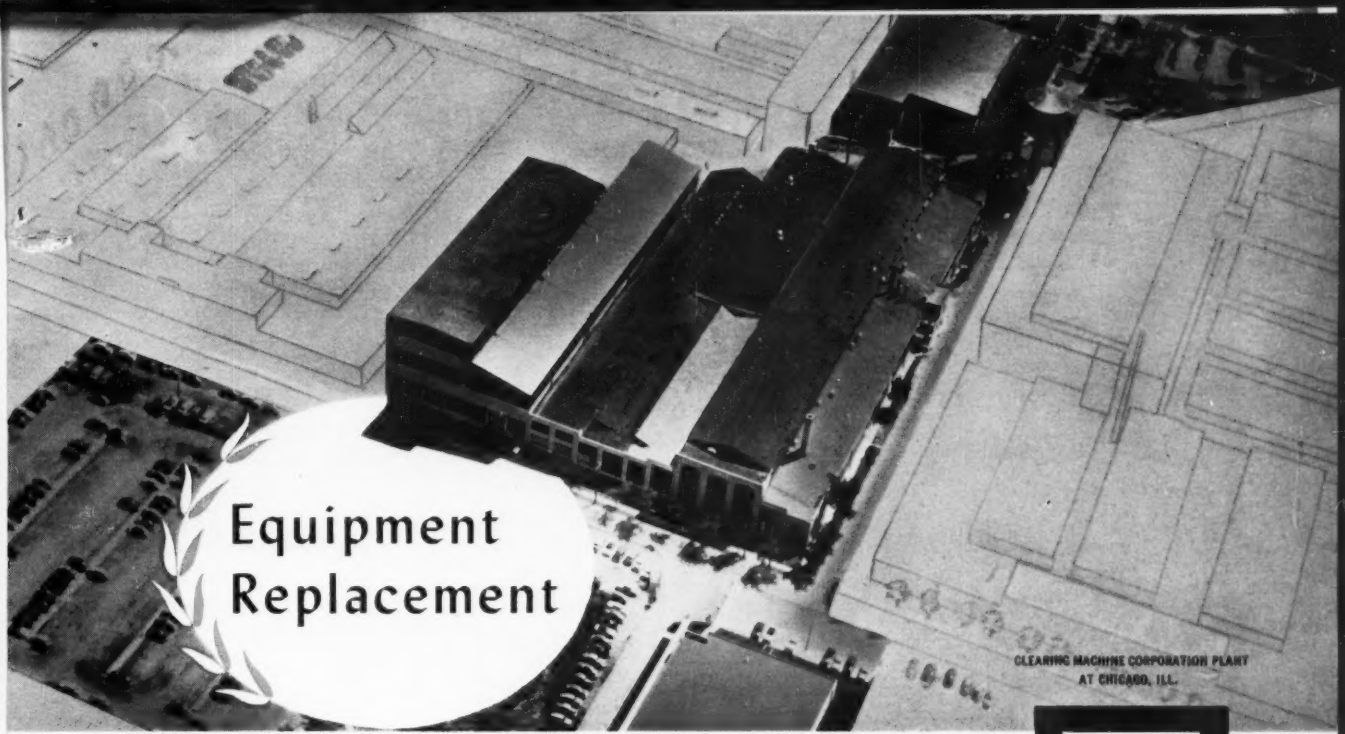


The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.

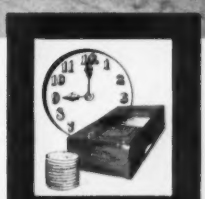

Various Sizes and Graduations
Shockproof
Dial Indicators
Converts AGD Adjustable Limit Snap Gages to Dial Type Instruments
Patented
Dializers
Adjustable Limit Snap Gages
Dial Bore Gages
8 Sizes Cover Range ¼"-12⅛"
Just a few of many
STANDARD Gages
In so many ways they help you do the job better . . . easier!
Dial Comparators
Dial Snap Gages
DuBo Plug Gages
Patented
Light in Weight Sensitive, Definite Check
Master Setting Gages
Write for the New Catalog C
STANDARD Gages
STANDARD GAGE COMPANY, INC.
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STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.



Equipment Replacement

CLEARING MACHINE CORPORATION PLANT AT CHICAGO, ILL.

. . . a Two-Fold Program



By JOHN R. BARTIZAL, *Executive Vice President*

CLEARING MACHINE CORPORATION

"The replacement of capital equipment involves two primary considerations; first, there is the problem of determining at what time it is most desirable and profitable to replace the equipment. This has been largely solved by the MAPI formula. The economic and cost factors are carefully appraised under this formula to determine when it is good business to replace the equipment. The Dynamic Equipment Policy developed by Machinery and Allied Products Institute and written around the MAPI formula, furnishes management an excellent tool in dealing with the problem of determining when the replacement of equipment should take place.

"The second important problem involved in the replacement of equipment is that of providing the necessary funds to undertake the programs indicated for current consideration under the MAPI formula. The particular facility under consideration may or may not be fully depreciated and even if the entire initial capital investment was recovered through depreciation, the funds thus recovered may be invested in current working capital or had been appropriated for some other purpose. Moreover, even if the funds had been set aside, it will certainly develop that the replacement of the investment will still require additional funds to cover the increased cost resulting from inflation and engineering improvements. In order to provide orderly financing of capital replacements, it is necessary to prepare a long term budget showing the funds to be required and the means for providing these funds. Only in this way can the directors of business know how much of earnings need to be retained for the purpose of re-investment in a replacement program."

ROCKFORD INSERT GROUP

Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . . .

March, 1953

INGERSOLL

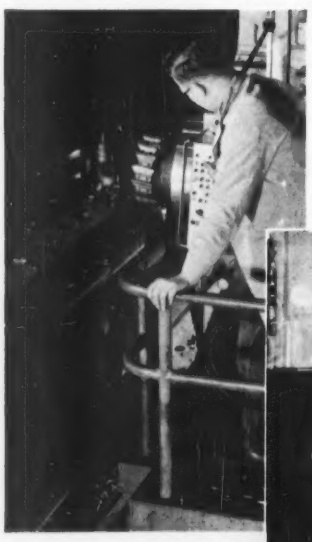
CUTTING 100 CUBIC INCHES OF HARD STEEL PER MINUTE WITH CARBIDE...

Each of these powerful and rugged Ingersoll machines was individually designed for a customer whose work calls for milling hard steel die blocks (220 to 375 Brinell). They machine this tough material in one-fifth the time required to do the same work with older equipment.

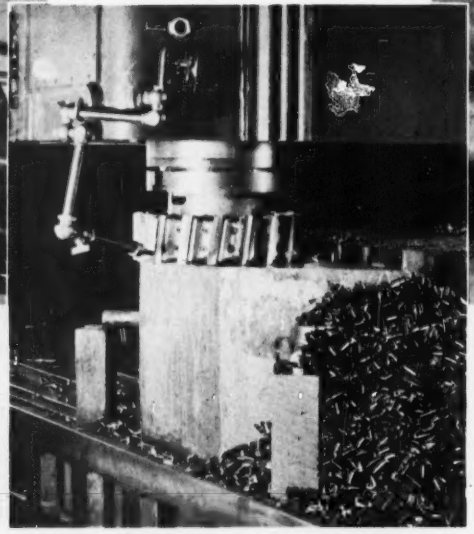
Metal removal rates of 100 cubic inches per minute in face milling and 60 cubic inches in shanking are made possible by proper machine design and specially developed Ingersoll carbide cutters.

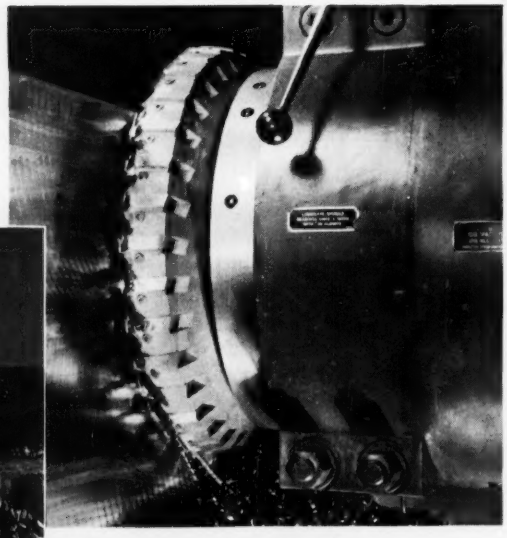
The experience gained by our machine and cutter engineers in developing this equipment for more economical production of die blocks is applicable to a wide variety of problems. It is available to you.

THE INGERSOLL MILLING MACHINE COMPANY, ROCKFORD, ILLINOIS



3" x 4" shanking cut with carbide at 5" feed rate (70 h.p.). Former HSS feed rate: 3/4".





24" Ingersoll Carbide Shear Clear face mill machines 2,000 square inches per hour, against 150 square inches per hour with HSS cutter on former equipment.

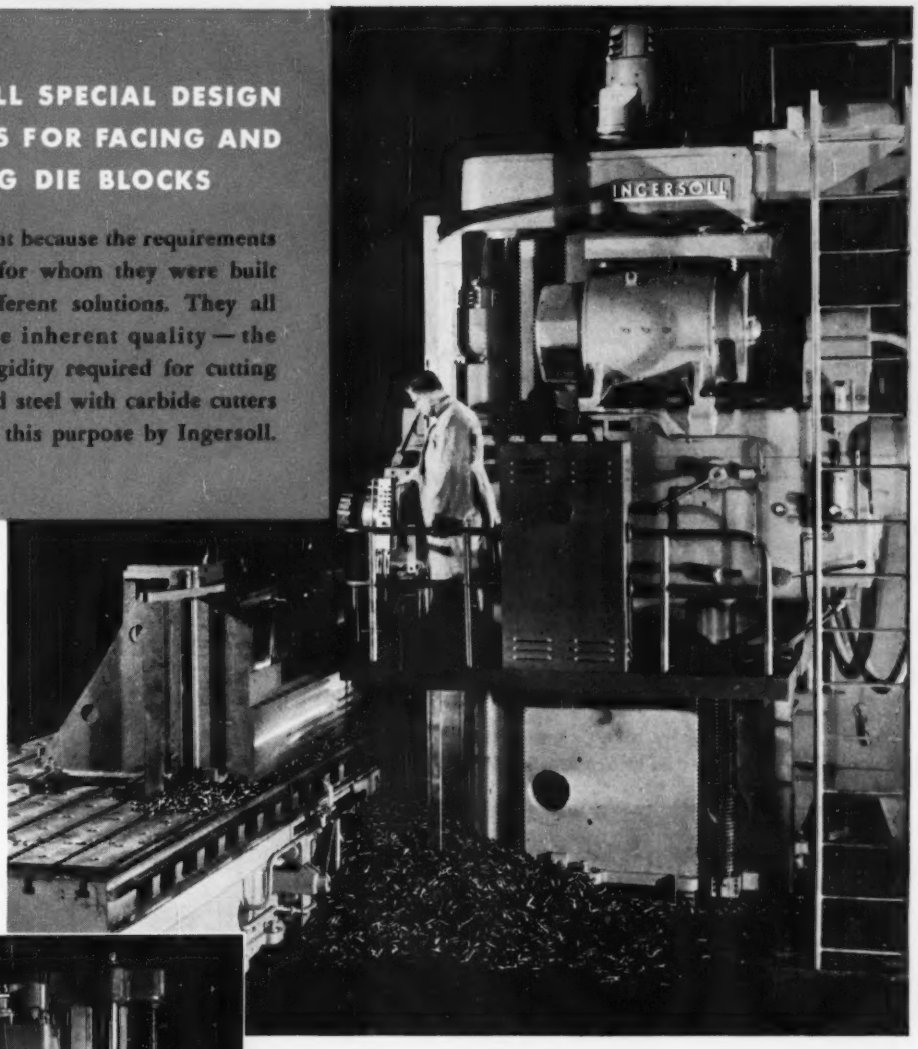
Feeding 2" per minute, Ingersoll Carbide Shanking Cutter takes 10"-wide cut in 220 Brinell steel die block.

MADE IN
ROCKFORD... TESTED ENGINEERING AND CRAFTSMANSHIP
ILLINOIS, U.S.A.

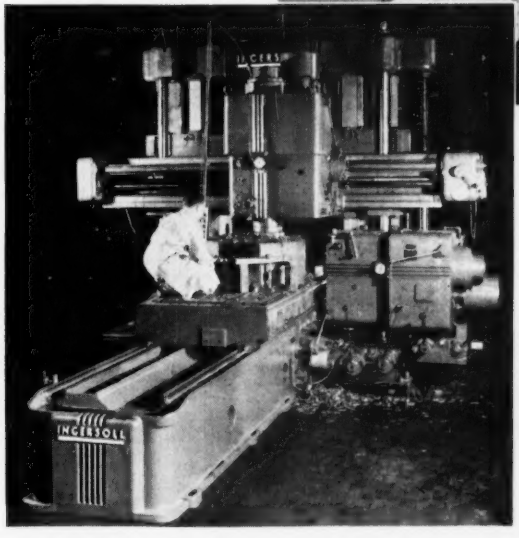


INGERSOLL SPECIAL DESIGN MACHINES FOR FACING AND SHANKING DIE BLOCKS

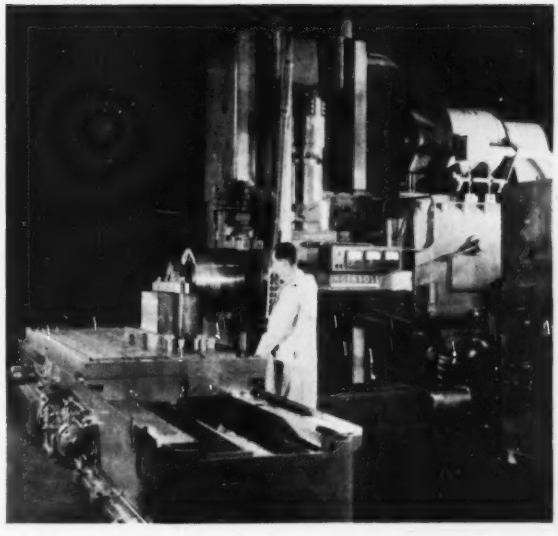
All are different because the requirements of customers for whom they were built called for different solutions. They all have the same inherent quality — the power and rigidity required for cutting extremely hard steel with carbide cutters developed for this purpose by Ingersoll.



At full power, this 7′ x 8′ x 24′ 100 h.p. Horizontal Spindle Milling Machine removes 100 cubic inches of metal per minute in facing operations. Weight: 126 tons.



Unusual nature of the customer's work dictated the design of this 72-ton, 75 h.p. Adjustable Rail Milling Machine with two heads for facing and shanking octagon-shaped die blocks.



Facing and shanking smaller die blocks in pairs, this 4′ x 6′ x 10′ Horizontal Spindle Machine has a 60 h.p. drive motor and weighs 52 tons.

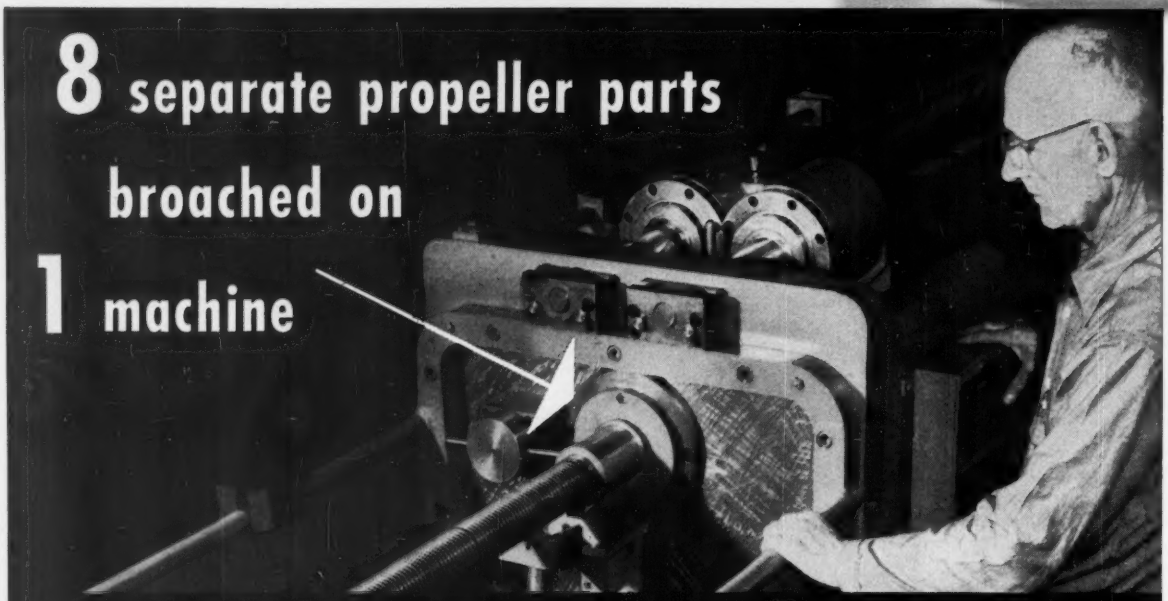


MADE IN

FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD

ILLINOIS, U.S.A.

8 separate propeller parts broached on 1 machine



A PROPELLER MANUFACTURER GOT THESE BENEFITS FROM HIS AMERICAN HORIZONTAL MACHINE:

1. **Tooling is readily inter-changeable for eight separate parts of short run production.**
2. **Large parts are easily loaded and unloaded.**
3. **Double helical drive for right and left hand helix readily adaptable to machine.**
4. **The horizontal machine provided the most tonnage and stroke per dollar invested.**



To broach the propeller sleeve gears, American built and equipped a standard HDE-30-72 horizontal broaching machine with six interchangeable lead bars for different internal spline operations. The machine broaches eight different propeller sleeve gears. Number of spline teeth vary from 43 to 55 with diameters ranging from 2¾″ to 3½″, and part lengths ranging from ¾″ to 3″ long. Ask American which type of machine best suits your requirements. Just send a part print and hourly requirements for our recommendations.

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

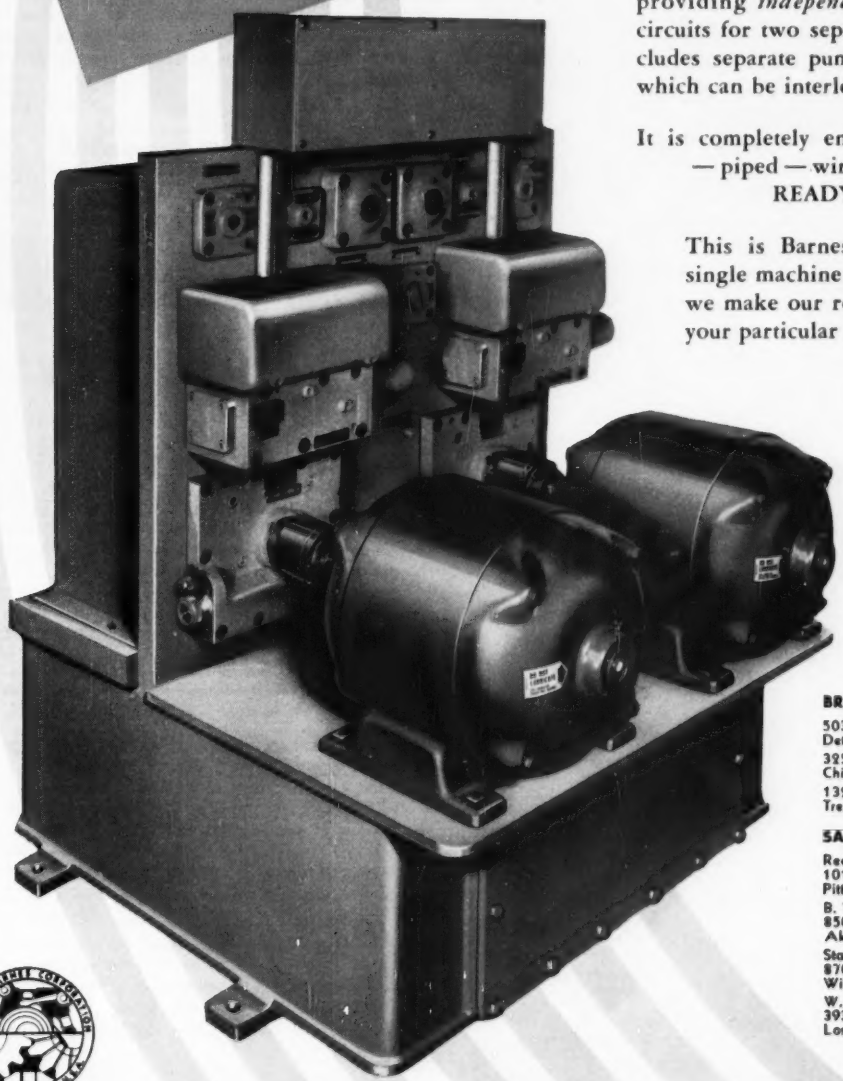
MADE IN

ROCKFORD...FOR ACCURATE, FAST METAL REMOVAL

ILLINOIS, U.S.A.



Barnes J.I.C. CODE MACHINE TOOL POWER UNITS



Illustrated is a Barnes Fluid Power Unit providing *independent* feed and traverse circuits for two separate spindle heads. Includes separate pumps, and control valves which can be interlocked electrically.

It is completely engineered — assembled — piped — wired — and tested — READY TO GO!

This is Barnes' solution to one single machine tool problem. May we make our recommendation for your particular needs?

INDUSTRIAL and AUTOMOTIVE HYDRAULICS

BRANCH OFFICES

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B. W. Rogers Company
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Akron 9, Ohio

Standard Machine & Tool Co.
870 Ottawa Street
Windsor, Ontario, Canada

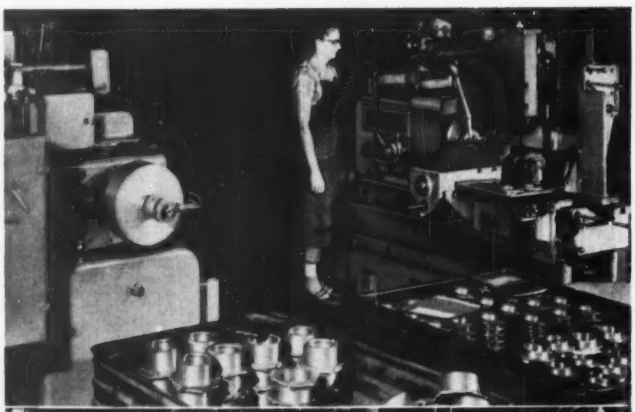
W. H. Del Mar Co.,
3931 W. Slawson Ave.
Los Angeles 43, California

JOHN S. BARNES CORPORATION • 305 S. WATER ST., ROCKFORD, ILLINOIS



YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...MADE IN ROCKFORD ILLINOIS, U.S.A.

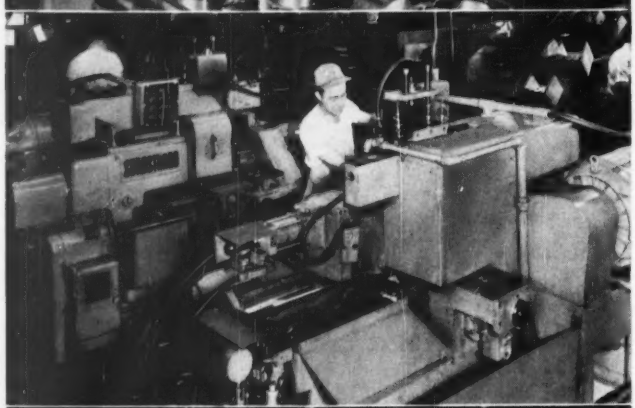
Why SUNDSTRAND AUTOMATIC LATHES CAN INCREASE YOUR PRODUCTION *on jobs like these...*



1 Small Lot Turning

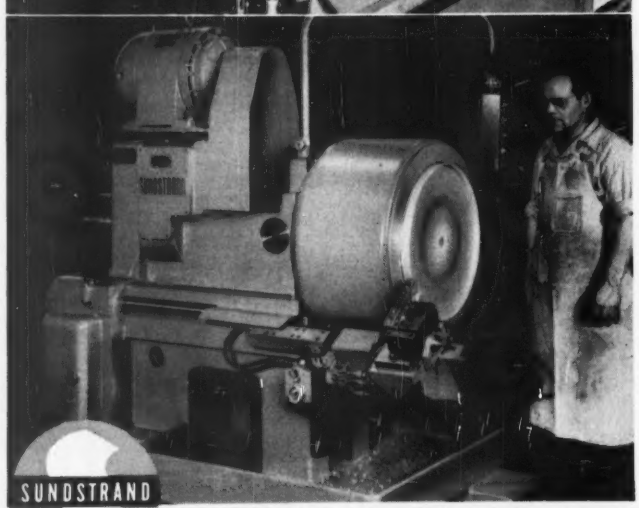
The two Model 8A Automatic Lathes installed with facing fronts, as shown at left, are part of a modern Sundstrand turning battery. Thirty-two different parts of cast iron and steel are turned in lot sizes varying from 150 to 200 pieces per lot. Production increase is as high as from 40 to 150 parts per hour compared to former method.

Because of the ease and simplicity of operating Sundstrand Automatic Lathes, one operator is able to handle 2 machines. If you have turning problems consult a Sundstrand methods engineer. There is no obligation for this service.



2 Long Run Turning

Here's fast, profitable machining of a pump body part requiring turning, facing, chamfering, drilling, and counter-boring operations. All are performed on a Model 8A Sundstrand Automatic Lathe with multiple tooling and automatic cycling. Two of many features contribute to the efficiency of this installation. First, the machine is automatic and completes a rough and finish cycle, once started by the operator. This enables one operator to run two machines and produce 132 bodies per hour instead of 40 per hour as obtained with the previous equipment and method.



3 Special Turning

The Sundstrand special short bed lathe illustrated is used for turning and facing the open end of a washing machine tub. It has a special tool block guided by a roller that rides against the O.D. of the tub and moves the tool to conform with any irregularities in the tub diameter. The short bed permits easy end loading and unloading to maintain a production of approximately 85 pieces per hour.

The prominent manufacturer who installed this and several other Sundstrand Automatic Lathes found he could do more work with fewer machines by using Sundstrand Automatic Lathes and "Engineered Production" Service.

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

MADE IN
ROCKFORD... MACHINE TOOL SHOPPING CENTER
ILLINOIS, U.S.A.



SOME OF THE DESIGN FEATURES THAT MAKE THIS PRODUCTION POSSIBLE

Greater Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Wider Feed Range

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Faster Set-Up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Quick Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-Clutching

All new models have been provided with automatic de-clutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to front carriage — resulting in fine finish and long tool life.

4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 7½ HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 60 to 1800 RPM	30 to 900 RPM 40 to 1200 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5″ 8¾″ 275″	 6″ 12½″ 250″	 8″ 15¼″ 250″	 12″ 17″ 250″
REAR SLIDE: Max. Stroke	4″	5½″	6½″	8″
LENGTH BETWEEN CENTERS	15, 24 & 36″	24, 36, 48 & 60″	24, 36, 48 & 60″	36, 60 & 84″

FREE *ADDITIONAL DATA*

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for bulletin 629.



SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2530 Eleventh St. Rockford, Ill., U.S.A.

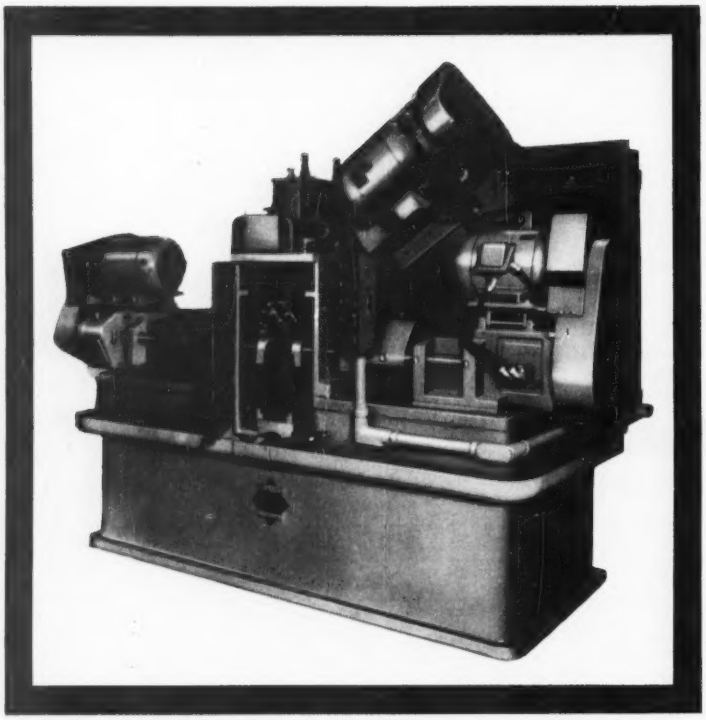
DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



MADE IN
ROCKFORD MADE MEANS PRECISION MADE...**ROCKFORD**
ILLINOIS, U.S.A.

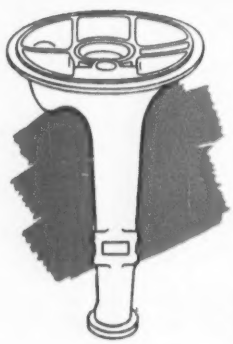
Rehnberg-Jacobson

SINGLE-STATION, SINGLE-PURPOSE MACHINE PERFORMS ODD OPERATIONS ON



TRUCK AXLE HOUSINGS

Most of the work on a piece of this sort is boring or turning, with some drilling of assembly-bolt holes in both ends. However, there are always a few odds-and-ends of operations left — and this machine is designed to take care of them in one quick pass. Four fair-sized drills come in from both sides simultaneously, a small drill comes in on an angle, and an unusual milling head takes care of a pad. Our sketch shows the position that the piece is put into the machine. The fixture is designed to handle either rights or lefts.



Whenever you have production-machine problems, give us a call — to see if we can give you a hand . . .

FIVE HOLES DRILLED AND ONE PAD MILLED FASTER AND CHEAPER THAN ON STANDARD MACHINES

You might think that a set-up with a couple of standard drilling machines and a standard milling machine would handle these operations. But, don't forget that might mean three times as many operators and three times as much handling as to do all the operations at once. The machine cost is the major determining factor, of course. Fortunately, Rehnberg-Jacobson machines are uncomplicated enough, as a rule, to be moderately priced and deliverable comparatively quickly. In this case, the machine is so simple, reliable, and efficient that it easily meets a production rating of 90 pieces an hour — and will take *rights or lefts as they come* without any adjustment or resetting of the fixture or tools.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

R-J

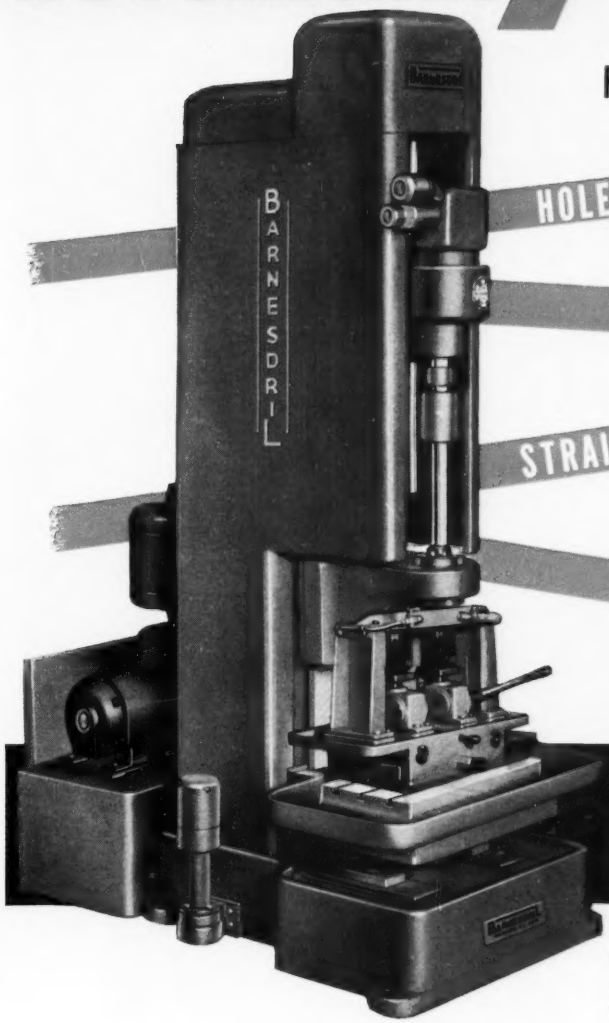
2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

MADE IN
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.



automatic Production

FOR



HOLE SIZING

FINISHING

STRAIGHTNESS

ROUNDNESS

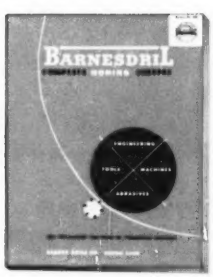
with NEW No. 305 Production Honing Machine

This new automatic machine now takes full responsibility for precision hole sizing, finishing, straightness and roundness. You can be sure of precision bore-to-bore sizing because the machine — latest in a complete line of **BARNESDRIL** Honing Process Equipment — removes the sizing operation from the effects of cut-and-try methods, uneven stone wear, and variations in finish from bore-to-bore.

The machine has a range of 2" to 5½", 25" stroke, and finishes bores up to 22" length. It provides truly high production hole finishing for a variety of small and medium parts with a minimum of production controls.

You are invited to view the New No. 305 Honing Machine and see the many production features it offers for fast, high quality, low cost bore finishing.

Send Parts Drawings for Estimate



Get a Copy of this new Complete Honing Service Bulletin No. 5005

HOLE BARNESDRIL FINISHING

BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS



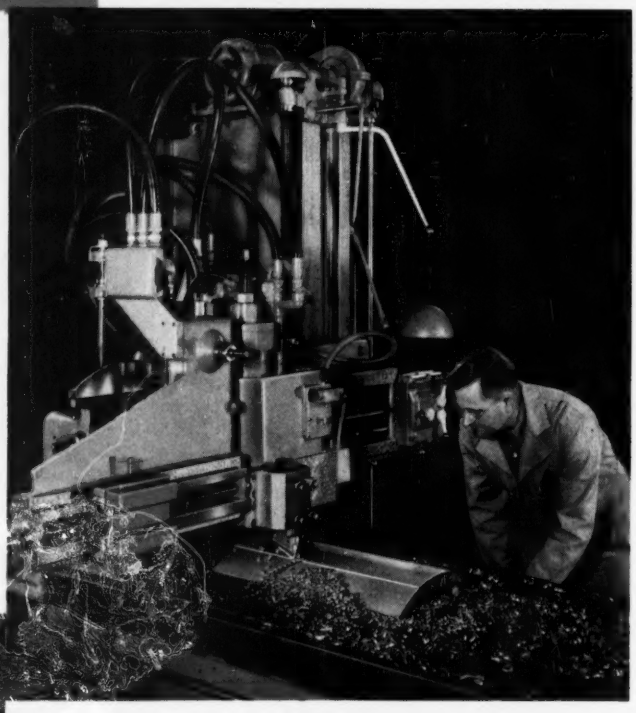
MADE IN

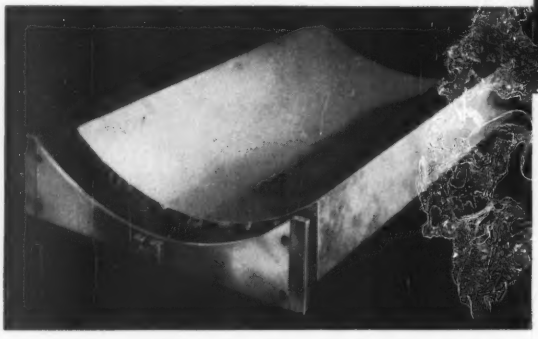
CENTER OF MACHINE TOOL EXCELLENCE...**ROCKFORD**

ILLINOIS, U.S.A.

use KOPY-KAT duplicating

TO
SIMPLIFY
FORM
MACHINING





Kopy-Kat duplicating is a fast, inexpensive way of reproducing identical forms. No expensive templates are needed. Forms are transferred direct.

For the L & W Tool & Manufacturing Co. at Milwaukee, Wisconsin, a Rockford Kopy-Kat machined a mold within limits of ± .002", using a simple flat stock template. They found the surface finish to be excellent, and the best obtained compared with any other method.

The entire machining time, including set-up for both work and template, was 39 hours floor-to-floor for both parts of the mold. The above illustration shows the convex part of the mold being machined. The concave part and the template are shown in the closeup view.

See the Kopy-Kat in action before selecting production duplicating equipment. A Rockford Machine Tool Co. representative will give you complete information.



Write for
Bulletin No. 12B

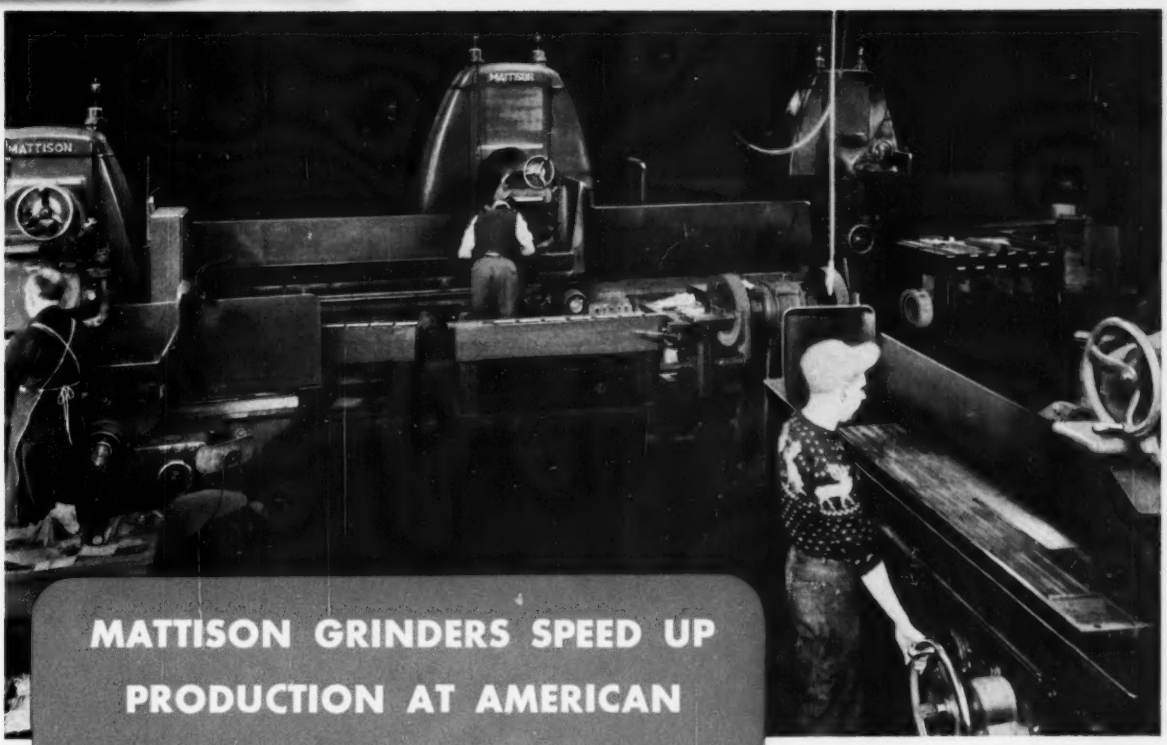
530 Hy-Draulic

ROCKFORD MACHINE TOOL CO.

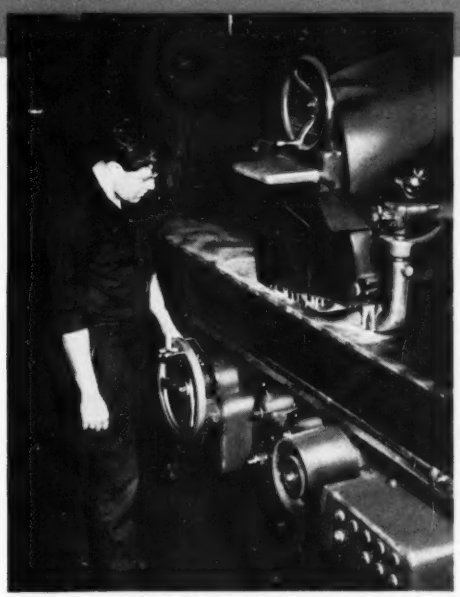
2500 KISHWAUKEE STREET ROCKFORD, ILLINOIS



MADE IN
ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS
ILLINOIS, U.S.A.



MATTISON GRINDERS SPEED UP PRODUCTION AT AMERICAN SAW & MFG. COMPANY



● The four Mattison High Powered Precision Surface Grinders shown above are used by American Saw & Mfg. Company for the grinding of annealed tool steel strips and bars on a real production basis in the manufacture of Lenox Precision-Master Ground Flat Stock. Exacting manufacturing specifications demand excellent finishes within close limits of accuracy.

The massive double column support, high power and rigidity of construction of the Mattison Grinder combine with accuracy and speed of operation to insure consistent precision results on a high production basis for American Saw & Mfg. Company. For complete information regarding the capabilities of the Mattison High Powered Precision Surface Grinder send for free circular.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

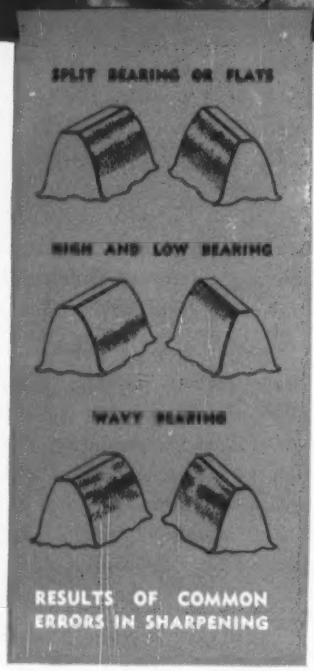


MADE IN

YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...**ROCKFORD**

ILLINOIS, U.S.A.





Proper Hob Sharpening

IS ESSENTIAL FOR ACCURATE ECONOMICAL GEAR PRODUCTION

The accuracy for which you pay in your hobs, machines, blanks, tooling and labor — is lost immediately when incorrectly sharpened hobs are used to cut gears.

Without precision control of your sharpening, the lead and tooth profile may lose their original accuracy. This loss of accuracy produces faulty, noisy gears, rejects, increased inspection time, and unnecessary non-productive machine time.

To maintain top accuracy and efficient, economical gear production, it is essential to have correctly sharpened hobs. Barber-Colman Sharpening Machines offer positive mechanical control over sharpening elements. These machines provide the means for sharpening hobs to their original tolerances.

BUILDERS OF PRECISION GEAR

MADE IN
ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION
ILLINOIS, U. S. A.



SAVES TOOL COSTS

When properly sharpened, your hobs cut more pieces between sharpenings, and less stock is removed per sharpening, resulting in an overall increase in hob life. Using Barber-Colman positive mechanical control, all teeth are uniformly sharpened to original tool accuracy.

SAVES INSPECTION TIME

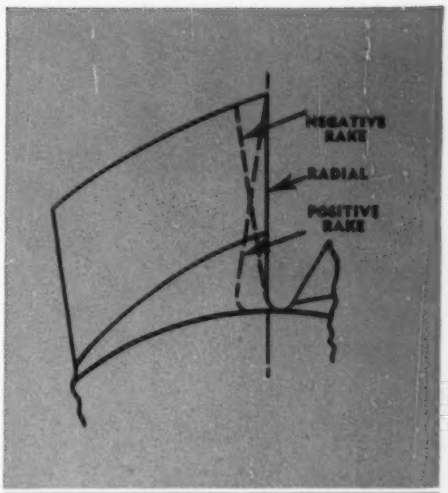
Correctly sharpened tools eliminate cut and try methods on the hobbing machine. Repeated inspections while setting up a job can be reduced considerably by reproducing the original accuracy of the hob. Correctly sharpened tools reduce finished inspection time to a minimum.

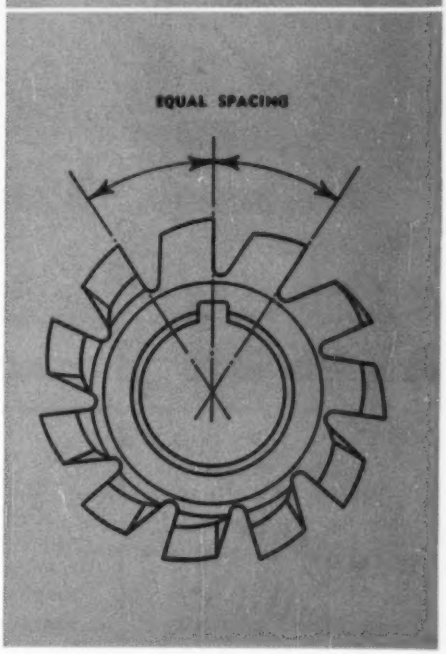
SAVES PRODUCTION TIME

Long wearing, accurately cutting hobs reduce machine stoppages to a minimum. Duplication of accuracy and form is consistent, promoting a smooth flow of production pieces. With this dependable cutting efficiency, the number of pieces per hob sharpening can be accurately determined, allowing the tools to be changed at the most conveneint time. Loss of machine output due to frequent hob changing is avoided.

SHARPENING SERVICE

Barber-Colman offers a complete sharpening service to all hob users. Features such as radialism or rake offset, high helix angles, and flute spacing are sharpened easily with Barber-Colman positive mechanical control. A Barber-Colman Field Engineer will consult with you on your special problems. Take advantage of this complete service and ask for recommendations today.





HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT 721 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911



MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.

TRULY...



AN AMAZING MACHINE!

EKSTROM, CARLSON

H-121 "POWER-ARM"

CONTOUR ROUTING *and* MILLING MACHINE

Do you want to banish, forever, tedious, *back-breaking* manual routing in the machining of your aircraft parts? Then, *here's* EKSTROM, CARLSON's solution! This machine, conceived by us, is specially designed to provide greater production at lower cost when template-routing and milling today's heavy aluminum plate or thick stacks of tough-cutting aluminum sheets. Hydraulically-operated, the entire operation is effected from a "Utopian" remote control pushbutton stand that starts the motors, lowers the head for template contact prior to the actual cutter descent, and controls the speed, rapid traverse, and direction of travel. The spiral-flute, collet-mounted router bit (also an ECCo product) is direct-driven by a high-cycle, 30 hp motor at 14,400 rpm. Even an inexperienced operator can quickly learn how to "pilot" the head around the most intricate template, and can then proceed to turn out an amazing quantity of work. For further details on this entirely new and revolutionary machine, write us *TODAY* . . . and learn all about it!

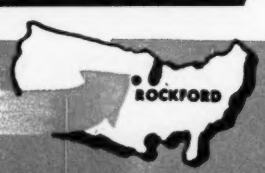
Powerful!
Fast-cutting!
Easy to Operate!

ECCO

DEPT. M-4
EKSTROM, CARLSON & CO.
1400 Railroad Ave.
Rockford, Ill.

FOR GREATER AIRCRAFT PRODUCTION!

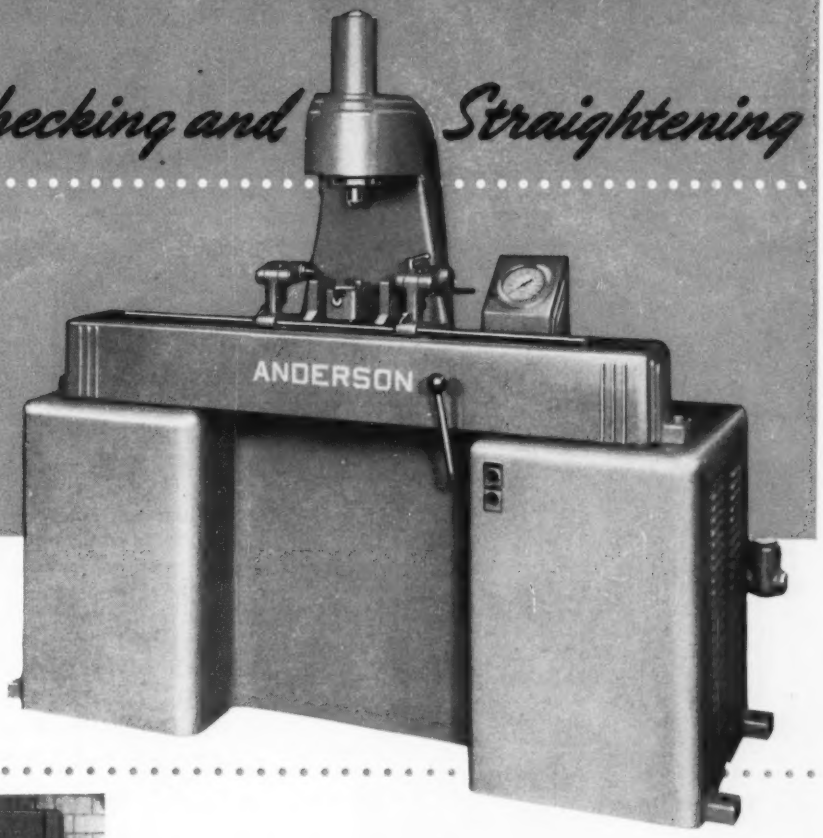
MADE IN
ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT
ILLINOIS, U.S.A.

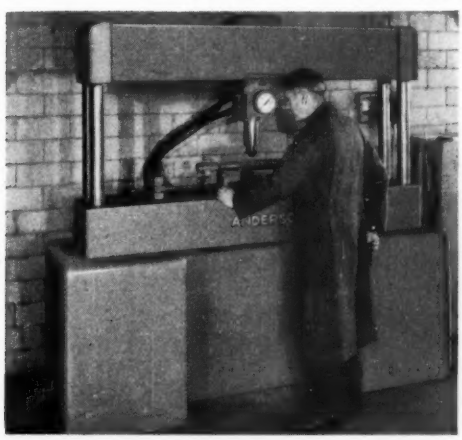


Anderson

HYDRAULIC POWER PRESSES

for Faster Checking and Straightening





Built with Stationary or Traveling Ram . . . capacities from 10 to 50 tons . . . so sensitive and accurate that a shaft may be bent .001". Pressure gauge, indicating ram loading . . . adjustable dial indicator shows amount of shaft run-out in preloaded, fully loaded, and unloading positions.

Flexible, sensitive control by rotary control valve operated by hand lever. An infinite range of loading up to capacity as lever is moved from 0 to maximum displacement. Push button control of hydraulic unit. Work table, 60" or 108" long. Available attachments include checking rolls, spring loaded centers, adjustable anvils and indicator. To increase production speed, an adjustable stop collar limits the stroke of the ram.

ROCKFORD
Anderson
BROS. MFG. CO.
ILLINOIS

SEND FOR BULLETIN No. 1-6

Complete Information on Both Stationary and Traveling Ram Types of Presses

ANDERSON BROS. MFG. CO., ROCKFORD, ILL.





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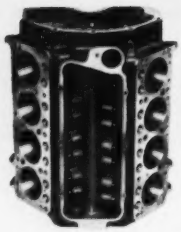
FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROCKFORD

ILLINOIS, U. S. A.

Performs 180 operations in 43.5 seconds. Drills, spot-drills, rough-bores, c'bores, c'sinks, and reams. Includes 360° rotating fixture for removal of chips at station No. 11, and automatic gauge of drilled holes at station No. 17.

UNIT No. 1





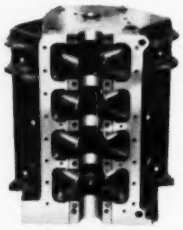
Capacity...

80!

CYLINDER BLOCKS AN HOUR

379!

OPERATIONS



GREENLEE

TRANSFER MACHINES

When you see these big Greenlee transfer machines working — turning out a tremendous quantity of work so smoothly and easily — you realize the qualities that make them great. Here is power, precision, durability, and a vast multiplicity of operations in a compact, integrated production line. Here is modern mass-production for component parts in its most successful form.

Concrete evidence of our experience and capability in designing and building Transfer Machines is exemplified with installations like this three-unit production line, now at work for a leading automotive concern.

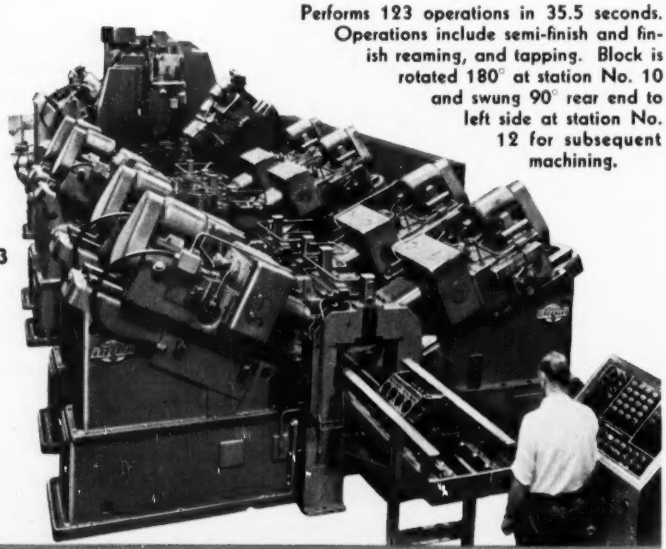


UNIT No. 2

Performs 76 operations in 43.8 seconds. Drills, c'sinks, c'bores, and trepans. Tilts part at station No. 1 to 180° for subsequent machining. Automatically gauges and cleans drilled holes at station No. 20.

Performs 123 operations in 35.5 seconds. Operations include semi-finish and finish reaming, and tapping. Block is rotated 180° at station No. 10 and swung 90° rear end to left side at station No. 12 for subsequent machining.

UNIT No. 3



PRODUCTION MACHINERY

GREENLEE

GREENLEE BROS. & CO. 1863 MASON AVE., ROCKFORD, ILL.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

MADE IN

ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS

ILLINOIS, U.S.A.



HOW DO YOU PUT A HEAVY PHOSPHATE COATING ON 90 MM. SHELLS?

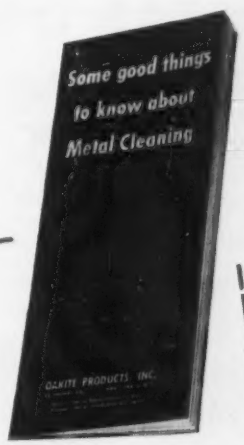
HOW CAN WE GET BETTER ELECTROCLEANING AT LOWER COST?

These are two of the simplest of the hundreds of metal-cleaning questions that come to us every day.

We answered our first metal-cleaning question for our first customer in 1909. Today we have 180 Oakite Technical Service Representatives answering metal-cleaning questions in the plants of thousands of customers in all the metal-working centers of the United States and Canada.

We thrive on these questions. They give us our daily work. The check list at the right shows the kind of jobs we do:

- ☐ Tank cleaning
- ☐ Machine cleaning
- ☐ Electrocleaning
- ☐ Pickling, deoxidizing
- ☐ Pre-paint treatment
- ☐ Paint stripping
- ☐ Steam-detergent cleaning
- ☐ Barrel cleaning
- ☐ Burnishing
- ☐ Rust prevention
- ☐ Treating wash water in paint spray booths
- ☐ Cooling and lubricating for machining and grinding



Please use the coupon to ask us your metal-cleaning question or to let us know of any other way in which we can help you.

OAKITE PRODUCTS, INC. 26 Rector St., New York 6, N. Y.

Tell me (without obligation) about Oakite methods for removing the following soils:

_____

_____

_____

Name _____

Company _____

Address _____

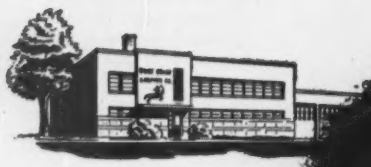
☐ ALSO send me a FREE copy of your booklet *"Some good things to know about Metal Cleaning."*

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives Located in Principal Cities of United States and Canada



Items like these available QUICKLY at CHASE® warehouses



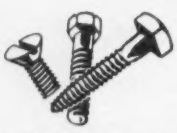
COPPER NAILS and TACKS



COPPER STORM NAILS



BRASS and BRONZE BOLTS and NUTS



BRASS and BRONZE CAP, MACHINE and LAG SCREWS



BRASS COTTER PINS
BRASS ESCUTCHEON PINS



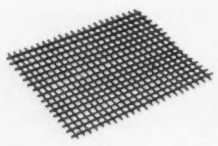
BRASS and COPPER RIVETS, BURS



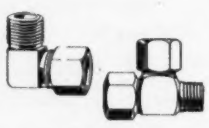
BRASS, BRONZE and COPPER WASHERS



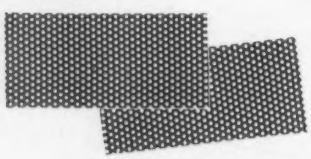
SOLDERING COPPERS



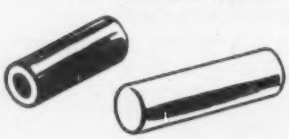
INDUSTRIAL WIRE CLOTH and BRASS STRAINER CLOTH



INDUSTRIAL and AUTOMOTIVE FITTINGS



PERFORATED METAL IN BRASS, BRONZE and COPPER



BEARING BRONZE BARS

CALL US FOR ANYTHING from Bearing Bronze Bars to Brass or Bronze Bolts . . . or any other brass or copper item for maintenance, repair, operating or production.

Twenty-three Chase warehouses are located in major industrial centers from coast to coast. Phone the one nearest you. We can usually fill your orders from stock.

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston†	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

Tool Steel Topics

BETHLEHEM STEEL

Invisible Cracks and How They Were Cured



One of our customers reported trouble with a roll used in the making of fine silverware. Made of A-H5, our 5-pct chromium air-hardening steel, the roll was of 6-in. diameter with a 10-in. working face, highly polished. It worked fine at first. Then a fine network began to show up on the silverware being rolled.

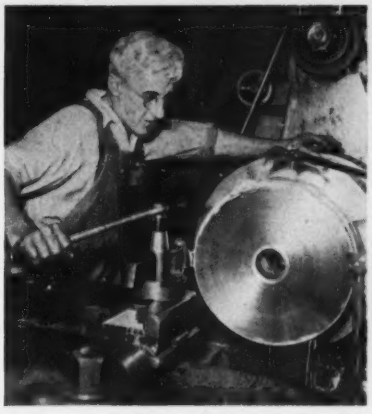
We suggested that the customer bring the roll to our plant, where we have the most modern facilities for diagnosing ailing tools and dies. When the roll was magnetic-particle tested, what appeared to the eye as a beautifully polished surface was revealed to be a fine network of grinding cracks.

"Never had that kind of cracks before," said the customer. "Can we get rid of them on a roll of such high hardness?"

"Yes," we replied. "But it's going to be a tricky job." So we checked with the experts in our division that produces hardened steel rolls. "It's not easy," they told us, "but it can be done. Use a wheel with a very coarse grit with a soft binder. Remove the surface at a maximum rate of .0005 in. per pass. You'll clean up the cracks somewhere between .005 and .010 in."

Then we checked with our specialist on grinding wheels, who gave us the exact code numbers for the grades of wheels that would make it possible to salvage the roll—and also prevent the recurrence of grinding cracks. Our customer went away well satisfied . . . and he's still using A-H5 with fine results.

Bring your tool or die troubles to our technical staff for advice that's based on years of practical experience—not just in making fine tool steel and in helping customers solve their problems, but in using hundreds of tons of our own tool steel each year in our manufacturing divisions. Perhaps we can help *you!*



This piece of Omega tool steel, tops in resistance to cold shock, will see service as a retainer block for a header die that is subjected to terrific loads in the cold-heading of steel artillery shell cases.

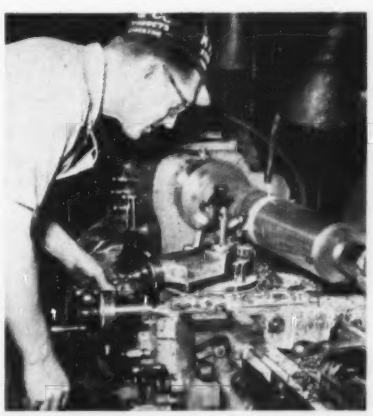


Some rough forgings of Lehigh S tool steel provide an interesting contrast to the finished liner for a tapering die which puts the desired taper on a 105-mm shell case after it has been headed.

COLD-EXTRUDING CALLS FOR GOOD TOOL STEEL

Great advances are being made in the technique of cold-extruding steel. It's a development that opens up new horizons in metalworking. The severity of this type of work calls for a variety of blue-ribbon tool steels—some must have the ultimate in wear-resistance, others must withstand terrific shock.

Bethlehem tool steels are in plentiful evidence wherever cold-extrusion tools and dies are being made. The accompanying photographs, made at Carando Machine Works, Stockton, Calif., show punches and dies being made from Bethlehem tool steels for use in the cold-extrusion of steel shell cases.



A bar of Lehigh S is being turned in a lathe to form a draw punch for a 3-in. cartridge case. Lehigh S has the highest wear-resistance of Bethlehem's high-carbon, high-chromium grades. It also holds to accurate size in heat-treatment.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

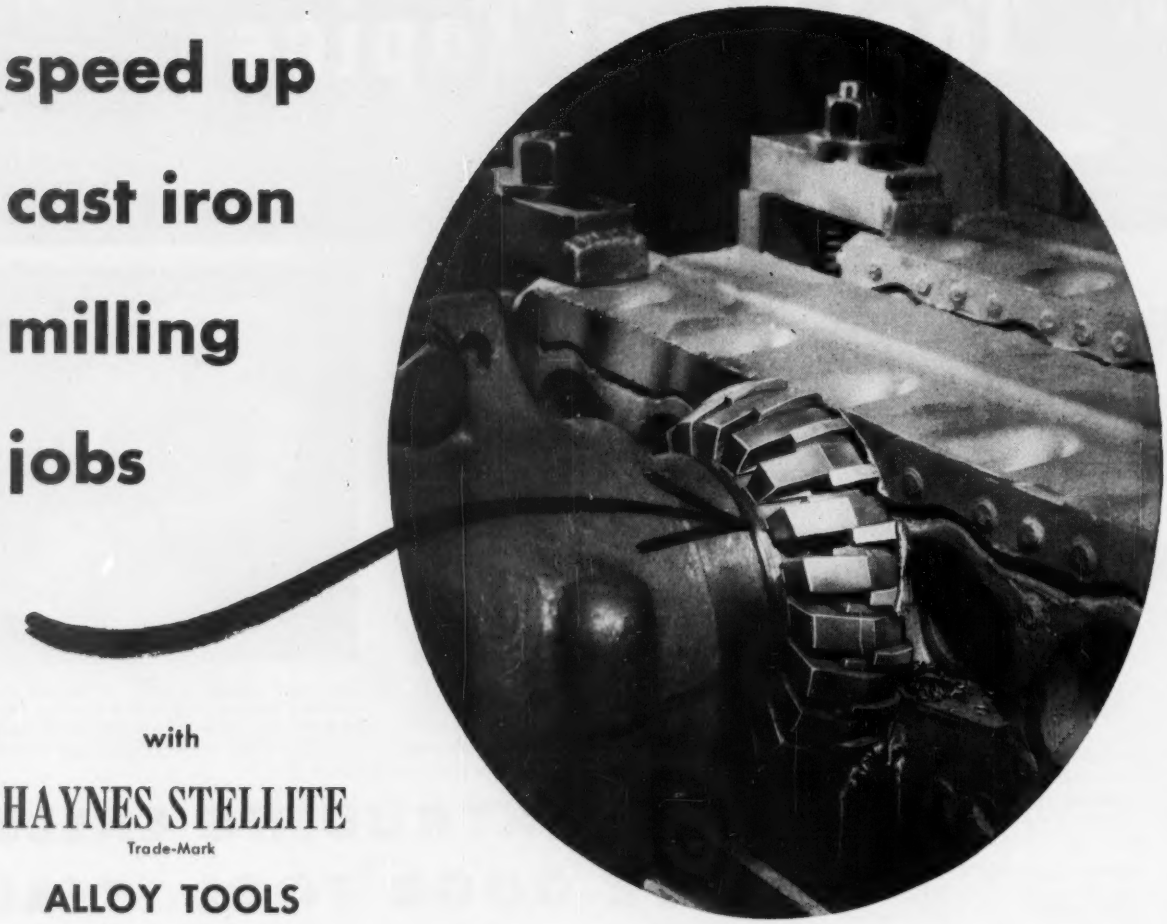


Avoid sharp corners in designing tools

Tools designed with sharp corners, such as in square holes, can often be produced satisfactorily when liquid-quenched tool steel is used. However, such designs are often so hazardous that a large percentage of cracked tools can be expected, no matter how carefully the heat-treatment is performed.

When the sharp corners are not necessary, the solution is of course to provide fillets. But when square holes or other sharp corners are essential in the design of the tool, the use of an air-hardening steel is recommended.

speed up cast iron milling jobs



with

HAYNES STELLITE
Trade-Mark

ALLOY TOOLS

High compressive strength at cutting temperatures . . . good impact strength . . . and extremely low frictional coefficients make HAYNES STELLITE alloys ideal tool materials for cast iron milling jobs.

Two hard grades of HAYNES STELLITE alloy are available for milling cast iron at high speeds. On soft cast iron (less than 185 Brinell), these tools can take light milling cuts at speeds up to 300 surface ft. per min. For heavy milling, speeds up to 250 surface ft. per min. can be used.

Hard cast iron up to 240 Brinell can be milled at speeds as high as 200 surface ft. per minute. Safe chip loads range up to 0.025 in. per tooth.

Tougher grades of HAYNES STELLITE alloy are available for efficient milling of castings that have irregular contours, surface imperfections, or inclusions, or where there are variations in chill depth.

HAYNES STELLITE alloy tools are available as fabricated shell-end mills and as insert milling-cutter blades. The different grades of alloy can be used for a wide variety of milling conditions. If you wish help on your own particular milling problems, write to the nearest Haynes Stellite Company office.

For a copy of the new manual, "HAYNES STELLITE Metal-Cutting Tools," write to our General Offices.

HAYNES
TRADE-MARK
alloys

Haynes Stellite Company.
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.



If you make hollow parts, here's where you can save steel and machining time

THE hole is already there when you use Timken® seamless tubing. Often, you can go right into finish boring as your first production step. You save machining time. Screw machine stations can be released for other operations. You get added machine capacity without additional machines.

By using Timken seamless tubing in place of bar stock, you save steel, too. Scrap loss is cut. You get more parts per ton of steel. And to help you save even *more* steel, the Timken Company offers a tube engineering service which recommends the most economical tube size for your job—guaranteed to clean up to your finished dimensions.

Timken seamless tubing gives you high internal quality because the piercing process by which it is made is basically a forging operation. Result: a uniform spiral grain flow for greater strength and a refined grain structure which brings out the best quality of the metal. And the Timken Company's rigid control keeps this quality uniform from tube to tube and heat to heat. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

CUMBERLAND GROUND BARS

We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

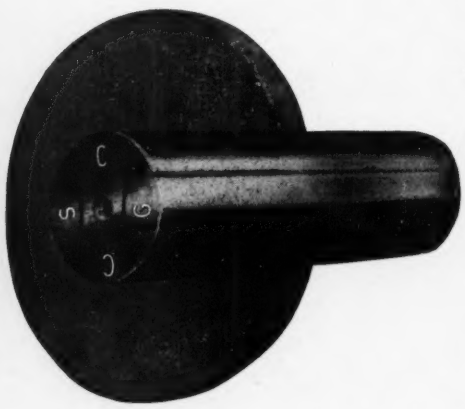


ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was showed the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explai to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

IMMEDIATE BARS

DISTRIBUTED BY

Baltimore, Maryland—Addison Clarke & Bro.
Boston, Mass.—Hawkridge Brothers Company
Bridgeport, Conn.—Hunter & Havens, Inc.
Buffalo, N. Y.—Jos. T. Ryerson & Son, Inc.
Cambridge, Mass.—Brown-Wales Company
Charlotte, No. Carolina—Edgcomb Steel Co.
Chicago, Ill.—Central Steel & Wire Co.
Cincinnati, Ohio—Jos. T. Ryerson & Son, Inc.
Cleveland, Ohio—The Bissett Steel Company
Detroit, Michigan—Central Steel & Wire Co.
Fort Worth, Texas—C. A. Fischer
Hartford, Conn.—Hunter & Havens, Inc.
Indianapolis, Ind.—Tanner & Company
Jersey City, N. J.—Jos. T. Ryerson & Son, Inc.
Lakeland, Fla.—Mine & Mill Supply Co.
Los Angeles, Calif.—Link-Belt Co., Pacific Div.
Louisville, Ky.—Neill-LaVielle Supply Co.
Martinsburg, W. Va.—W. H. Heiston & Son
Milwaukee, Wis.—Central Steel & Wire Co.
Montreal, Canada—Drummond, McCall & Co., Ltd.
New Orleans, La.—R. J. Tricon Co.
New York City, N. Y.—Bright Steel Corp.
Oakland, Calif.—Link-Belt Co., Pacific Div.
Philadelphia, Pa.—Charles Bond Company
Philadelphia, Pa.—Horace T. Potts Co.
Pittsburgh, Pa.—McKee-Oliver, Inc.
Portland, Maine—W. L. Blake & Company
Portland, Oregon—Link-Belt Co., Pacific Div.
Providence, R. I.—Congdon & Carpenter Co.
San Francisco, Calif.—Link-Belt Co., Pacific Div.
Seattle, Wash.—Link-Belt Co., Pacific Div.
Spokane, Wash.—Link-Belt Co., Pacific Div.
Toronto, Canada—Drummond, McCall & Co., Ltd.
Worcester, Mass.—Pratt & Inman

CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 **INCORPORATED 1892**



☐ High Strength



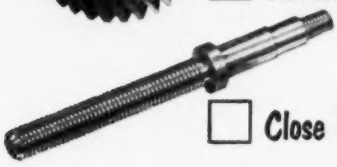
☐ Fine Surface



☐ Toughness



☐ Hardenability



☐ Close Tolerance



☐ Accuracy of Section

WHAT ARE YOUR REQUIREMENTS?

Republic Cold Drawn Alloy Bars deliver all 6 . . . plus

UNIFORM MACHINABILITY

Check the properties your steel parts require . . . add the economy of uniform machinability . . . and you have the answer to production and cost problems . . . Republic Cold Drawn Alloy Steel Bars.

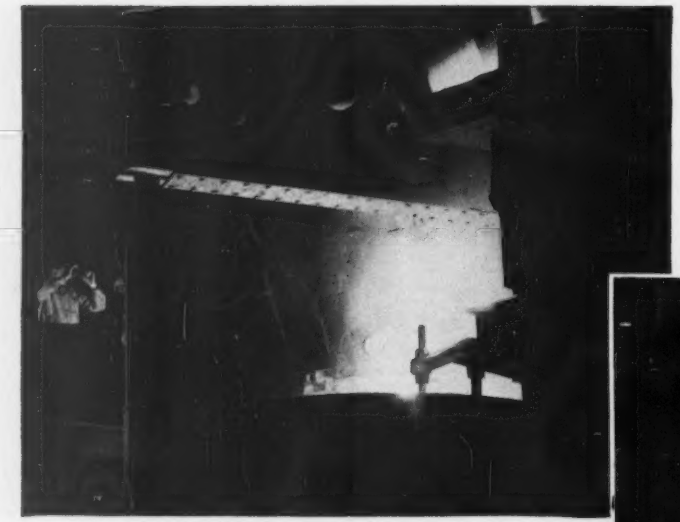
High-speed automatics take full advantage of the cost-cutting qualities of Republic Bars. Designers can make full use of the high strength and uniform structure of these cold drawn bars. Production men can get the ideal combination of wearability and strength out of the uniform hardenability and toughness of the alloy steel.

And . . . Republic 3-Dimension Metallurgical Service focuses the experience of our Field, Mill, and Laboratory metallurgists on your production problems for the best answer with Republic Cold Drawn Alloy Steel Bars.

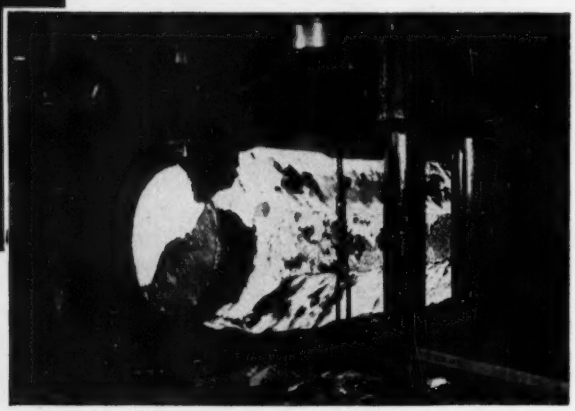
REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic COLD DRAWN
REPUBLIC STEEL
ALLOY STEEL BARS

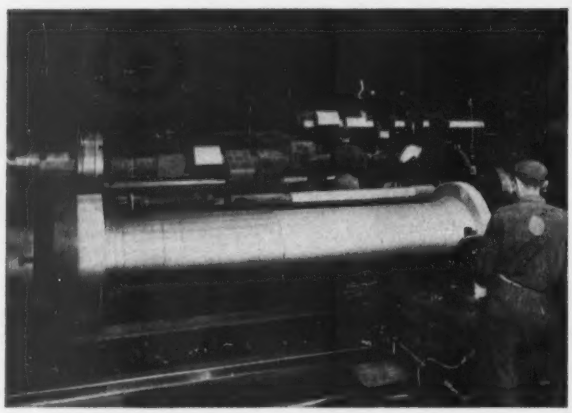
HERE'S THE STORY OF YOUR FORGINGS AT NATIONAL FORGE AND ORDNANCE CO.



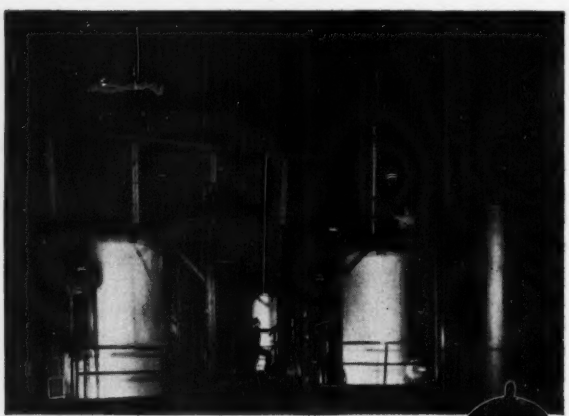
1. Basic Electric Steel is made for all forgings.



2. Forgings are made from Ingots of proper size for the best final result.



3. Forgings are rough-machined before heat treatment to insure greatest uniformity.



4. The heat treating equipment is adapted to the job to be done.



5. National Forge can make your forgings—large or small—rough or finished.



6. Precision is a by-word at National Forge.

NATIONAL FORGE AND ORDNANCE CO., IRVINE, WARREN CO., PENNA.

WHAT'S YOUR GUESS ON THIS

Machinability Comparison?



ENDURO STAINLESS STEEL BARS ARE —% AS MACHINABLE AS BESSEMER SCREW STOCK

Would You Say

(a) *42%* (b) *67%* (c) *100%*
(d) *33%* (e) *90%*

?

YOU CAN APPLY the high physical and chemical properties of ENDURO Stainless Steel to duplicate parts you're running now —and still get fast automatic production.

Free-Machining ENDURO Bars are cold-finished by Republic's Union Drawn Steel Division especially for that purpose. They provide close tolerances, accuracy of section, uniform soundness, and fine surface finish.

Two grades are fully 90% as machinable as Bessemer screw stock. If 90% was your answer to the question above, you've probably had experience with Free-Machining ENDURO Bars. If you haven't, Republic metallurgists will be glad to give you prompt assistance on applications, processing, and use. Free-Machining ENDURO also is available in hot-rolled bars and in wire. Get more details from your nearest Republic District Sales Office, or write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

Republic ENDURO®
FREE-MACHINING
STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

HERE'S

WHAT HAPPENS TO A JOHNSON UNIVERSAL BRONZE BAR



Every Application Saves Time and Money!

IN ADDITION to the common uses, bushings, bearings, washers and thrust plates, certain manufacturers are making bronze gears, sheaves, trolley wheels, rollers, guide rolls, air tool tips, etc., from Johnson Universal Bronze. There are reasons for wider use of this material: ease of machining, corrosion resistance, non-sparking properties, long life, less frequent replacement . . . to mention a few.

Johnson Universal Bronze is available from distributors' stocks in over 400 sizes. Round bars, solid or cored, are completely machined, OD, ID and ends, and are usable from end to end . . . no waste. Hexagon bars, not machined, are made in a range of sizes, too. Investigate the possibilities of using Universal Bronze for special applications in your industry. Write for catalog, showing sizes available.

JOHNSON BRONZE COMPANY
520 South Mill St., New Castle, Pa.

Over *400* Sizes

Stocked by your local JOHNSON *distributor*

JOHNSON B BEARINGS
Sleeve-Type
Sleeve Bearing Headquarters Since 1901

THEY COME IN ALL SIZES FROM FLYWEIGHTS TO HEAVYWEIGHTS





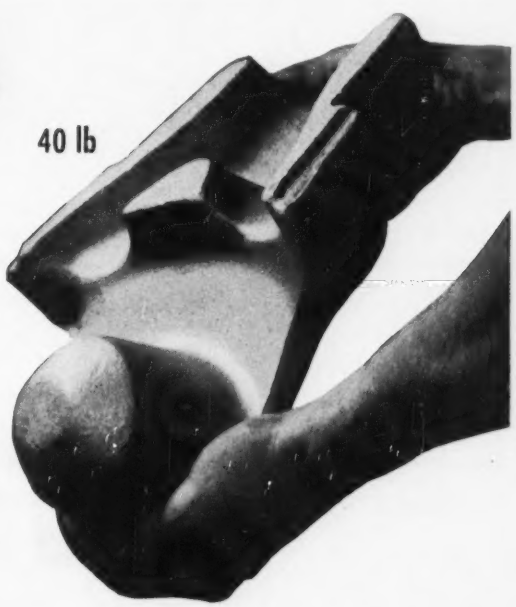
Need something small in drop forgings? Or do your present needs call for a forging that runs to weight—say a couple of hundred pounds or more?

Either way, Bethlehem is well able to handle your design—in any size that falls between these two extremes. Through the years we've made millions of closed-die forgings for the oil, mining, aviation, automotive, electrical, and other types of industries . . . and we're still going full blast, turning out a wide range of sizes and types for both old and new customers.

Keep our name handy, won't you? Think Bethlehem and call Bethlehem for a good job of forging—a job planned right, done right.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

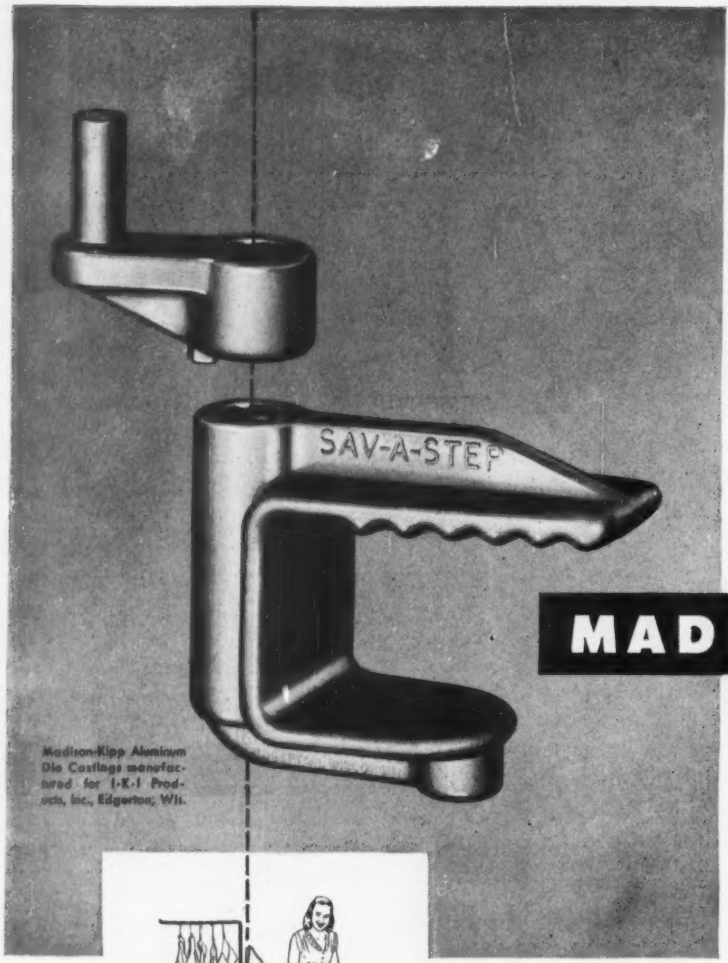


BETHLEHEM FACILITIES FOR CLOSED-DIE FORGINGS INCLUDE:

Full die-sinking equipment
Steam and board drop hammers 1500 to 8000 lb
Mechanical presses to 3000 tons
Upsetters to 9 in.
Heat-treating equipment
Cleaning and inspection service

BETHLEHEM STEEL

BETHLEHEM DROP FORGINGS



Madison-Kipp Aluminum Die Castings manufactured for I-K-I Products, Inc., Edgerton, Wis.

It Is Basic To Americans To Lighten Women's Work

MADISON-KIPP

ZINC AND ALUMINUM DIE CASTINGS



Little gadgets, as well as big home appliances, are in no small way responsible for the American success story of relieving the drudgery of the repetitive jobs of the homemakers.

Illustrated here is a little device of value to women who use it and to designers who must be sure to add eye appeal to such other important factors as cost economy and high quality.

Madison-Kipp die castings may solve your design problems quickly. Please send all inquiries to our home office in Madison, Wisconsin.

MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WISCONSIN

kipp

Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools



tool steel is the cornerstone of our business

Just as the cornerstone is of fundamental importance to a building, tool steel is the base of our business. And ever since we were founded — now over 50 years ago — we have been proud of our reputation as the nation's leading producer of tool steels.

We have always given our customers what they needed — quality and service — regardless of their volume of business or the general supply and demand situation. During last year's steel shortage, for instance, all our customers had their share of our production.

You too, can benefit from our long experience in this field through our freely available metallurgical service . . . and from our reliable delivery service through our fully stocked warehouses, conveniently located all over the country.

SEND TODAY for the unique Crucible Tool Steel Selector — a twist of the dial gives the tool steel for your application.

Rex® High Speed Steels
Peerless Hot Work Steels
Halcomb 218
Chro-Mow®
Sanderson Carbon Tool Steels
Ketos®
AirKool Die Steel
Airdi® 150
Nu-Die V Die Casting Steel
CSM 2 Mold Steel
La Belle® Silicon #2
Atha Pneu

SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

Crucible Steel Company of America
Dept. M, Chrysler Building, New York 17, N. Y.

Name_____

Company_____ Title_____

Address_____ City_____ State_____

9" diameter, 3-colors

CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

SHOP TIPS

New, Free Magnet Idea Kit for Shops



A handy new literature kit showing the hows and whys of permanent magnets is currently sparking shop men to real savings in time, money, effort.

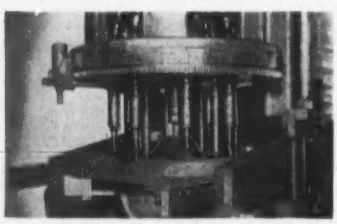
To date, the magnets have proved very effective as sheet steel separators, magnetic stands, tool-holding devices, sweepers' "pickup" tools, paper grippers and tool retrievers, to name a few uses.

Magnet Idea Kit can be obtained free from Carboloy Department of General Electric Co. (See address at right.)

★ ★ ★

Drill Cast Iron with Carbide Twist Drills

Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over



H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Co. (See address at right.)

★ ★ ★

New Masonry Drills Won't Stall, Pack



An outstanding advance in rotary drilling of masonry was recently unveiled in Carboloy oval-flute "Live-Spiral" Drills.

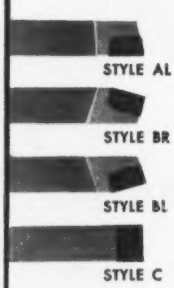
The drills, tipped with Carboloy cemented carbide, won't stall or pack even at very rapid speeds. They work equally well in concrete, brick, plaster, slate or asphalt. For full details write Carboloy Department of General Electric Company. (See address at right.)



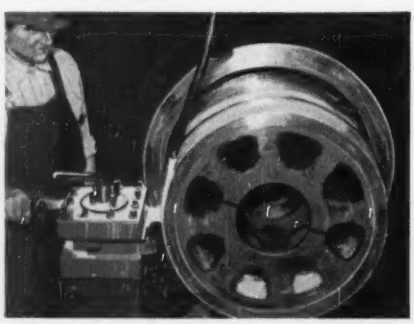
YOUR CARBOLOY FIELD ENGINEER SAYS—

We can help you get swift tool-

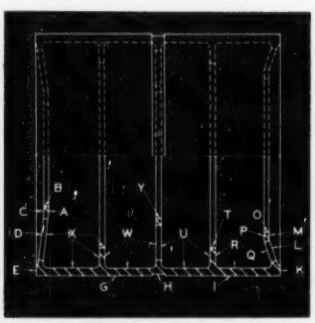
Here's how one leading manufacturer quickly adapts low-cost Standard Carboloy Tools to his single-point tool machining operations – jobs that would normally require costly "specials" – and gets them on the jobs *in minutes*. No special grinding equipment. No delays or heavy inventories. By standardizing on "Standards," he gets full carbide benefits shop-wide – just as you can. Check these pages. Then send me blueprints of your tough single-point tool jobs. We'll show you how easily "Standards" can be best for you, too.



1 Gets 14 "specials" from these 4 styles of "Standards" – A large Midwestern manufacturer (name on request) needed 14 specially shaped tools for a rush job on cast steel gear blanks. From their stocks they selected the 4 Standard Carboloy Tool styles shown . . . ground them to the shapes needed in minutes per tool. No long waits for costly "specials," no extra expense or production delays. (See illustrations, below and on right-hand page.)

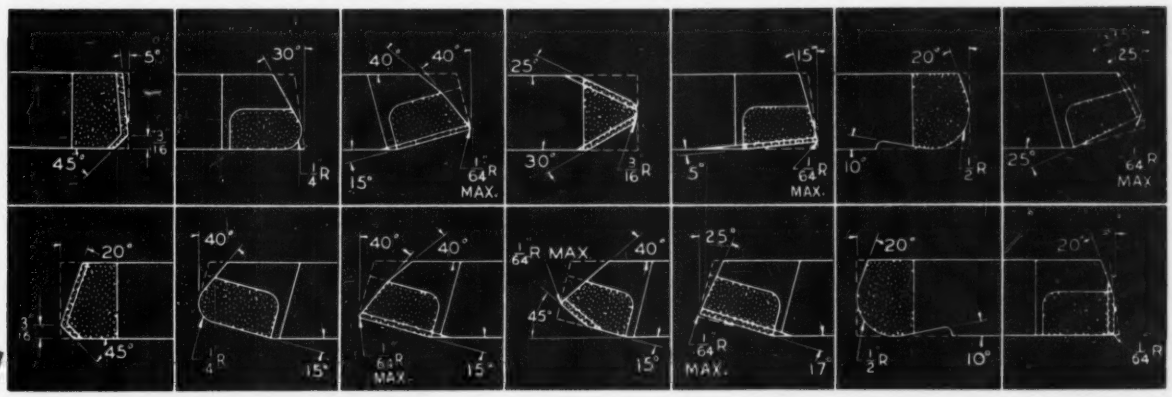


Here is the job – a tough steel casting 26" in dia., 28" wide, and requiring a wide variety of rough and finish turning, facing and boring operations.



Sketch of side view of part showing many of the single-point tool machining operations necessary for the job.

convert to Standard Carboloy Tools and ups, low inventories, lowest tool cost



Dotted lines show the original tip ends of the 4 styles of Standard Tools before they were ground to these 14 special shapes in minutes.

2 **Easy for you to use, also**—Adapting Standard Carboloy Tools to your special-tool needs is a cinch. They can be rough-ground quickly on ordinary silicon carbide wheels, finished economically on diamond wheels. Standard Carboloy Tools stay sharp up to 10 times as long as high-speed steel tools, last 10 times longer, too.

3 **You get quicker tool-ups** – You'll cut tooling delays to minutes instead of days or weeks with "Standards" on your shelves. Your inventories will be lower – costs, too. Just 11 styles of Standard Carboloy Tools can be adapted to do up to 80% of all your single-point tool machining.

4 **You enjoy plant-wide benefits** – Let us help you convert to standard styles of Carboloy Tools – for plant-wide benefits. Thousands of shops have done so . . . and now profit from such things as production gains of up to 300%, downtime savings that alone more than pay for the entire cost of the tools.



To get maximum performance from Standard Carboloy Tools, we have the industry's best all-around Carbide Service Program. Includes all types of free how-to-do-it technical data, a tuition-free training school, etc. For details, mail coupon today.

CARBOLOY TOOLS ARE STOCKED COAST TO COAST BY

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

Look under "Tools" in the Yellow Pages of your local telephone book, or in Thomas' Register, for address and phone number of your nearby Carboloy distributor, branch or district office.

"Carboloy" and "Live-Spiral" are registered trademarks of Carboloy Department of General Electric Company

5 **Send blueprints of your "specials"** – Let us review your single-point tool machining jobs that now require costly special tools . . . show you exactly what "Standards" can be adapted, and how. Send blueprints today to the factory at Detroit, or to your nearest Carboloy District Office. No charge or obligation. See coupon below.



MAIL COUPON TODAY!

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11147 E. 8 Mile Road, Detroit 32, Michigan

Gentlemen: Please send me, at no cost or obligation, Carboloy General Tool Catalog, GT-250.

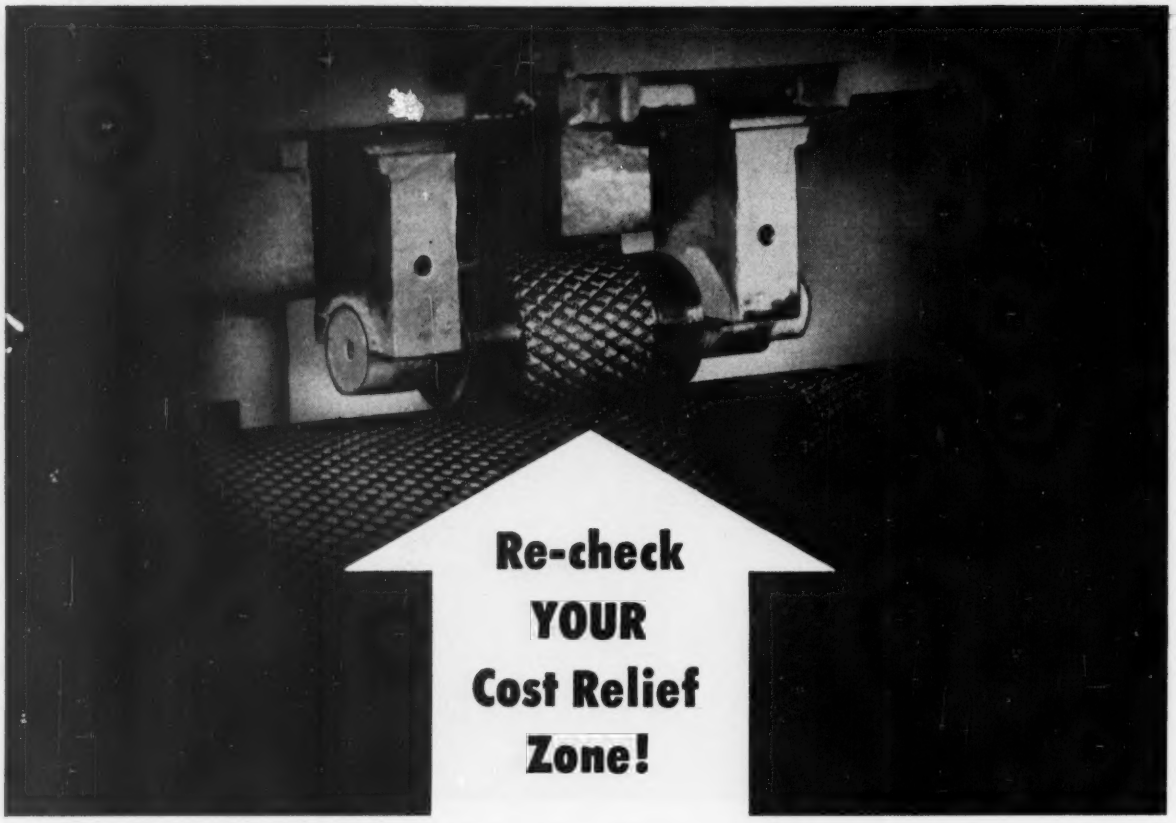
☐ Also, I am enclosing ( ) blueprints or sketches of the single-point tools we use. Show me, free of charge, which low-cost Standard Carboloy Tools can be quickly ground to these special shapes (and how to do it).

Name _____ Position _____

Company Name _____

Address _____

City _____ Zone _____ State _____



Hundreds of Other Men Responsible for Tooling and Production Have Acted on This and Profited!

Here is a step you can take now to get relief from high production costs: *Re-check your tools and dies!* How much production time are you losing because of too frequent shutdown for die regrinding? How much *extra* money are you spending on costly die finishing, adjusting? Are your tools and dies breaking or wearing out too fast? A tool and die re-check will often give you the answers.

Take the job shown above. Knurling mills like this impress patterns on large .35% carbon steel rolls for embossing cloth and plastic. Some of the patterns are fragile and the sections as deep as 1/16" must not collapse. The mills must be hard enough to prevent upsetting, tough enough to prevent edges from breaking under pressures up to 5 tons. A re-check of the job showed that better performance could be expected if a more dependable die steel were used. Carpenter No. 11 Special (Water-Hard) met all of these requirements . . . and provided the necessary cost relief.

If you're looking for immediate ways to bring costs down to a respectable level, act on this now. Use the Carpenter Matched Set Method to select the one steel best suited to cut costs. This Method is backed by *dependable* tool and die steels that *stay* on the job. Then, for rush delivery, call your nearest Carpenter Mill-Branch Warehouse or Distributor. THE CARPENTER STEEL COMPANY, 105 W. BERN ST., READING, PA.

Are You Missing These Opportunities In *Your* Cost Relief Zone?

- Less die finishing and adjusting
- Greater output between grinds
- Fewer heat treating failures
- Less machine downtime

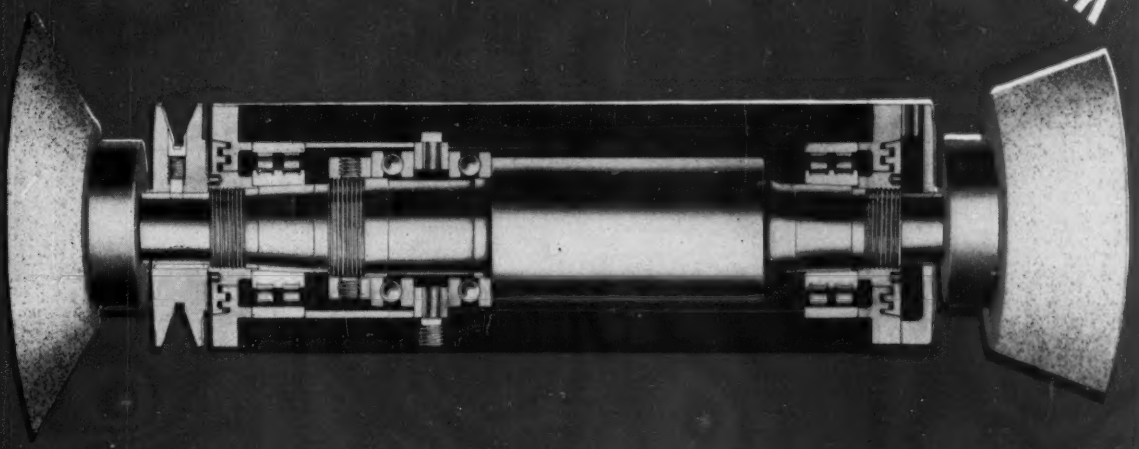
On Job After Job Carpenter Matched Tool and Die Steels Have Made Them Possible!

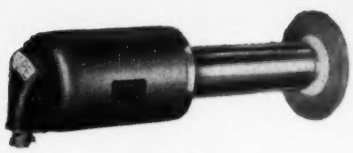
Carpenter STEEL — Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U. S. A. and Canada

IT'S THE SPINDLE THAT DOES THE WORK





P-32T



P-666

Specify POPE Precision Grinding Spindles and be certain of continuous production of finely finished parts.

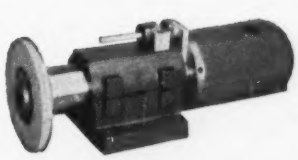
Look at the pair of thrust bearings. They eliminate any endwise movement of the shaft in either direction.

Look at the double row cylindrical roller bearings. They have the rigidity to properly support the wheel for removing metal faster while producing fine surface finishes.

Lubrication — POPE System — requires no attention for the life of the bearings.



P-10009



P-2652A

P-2500



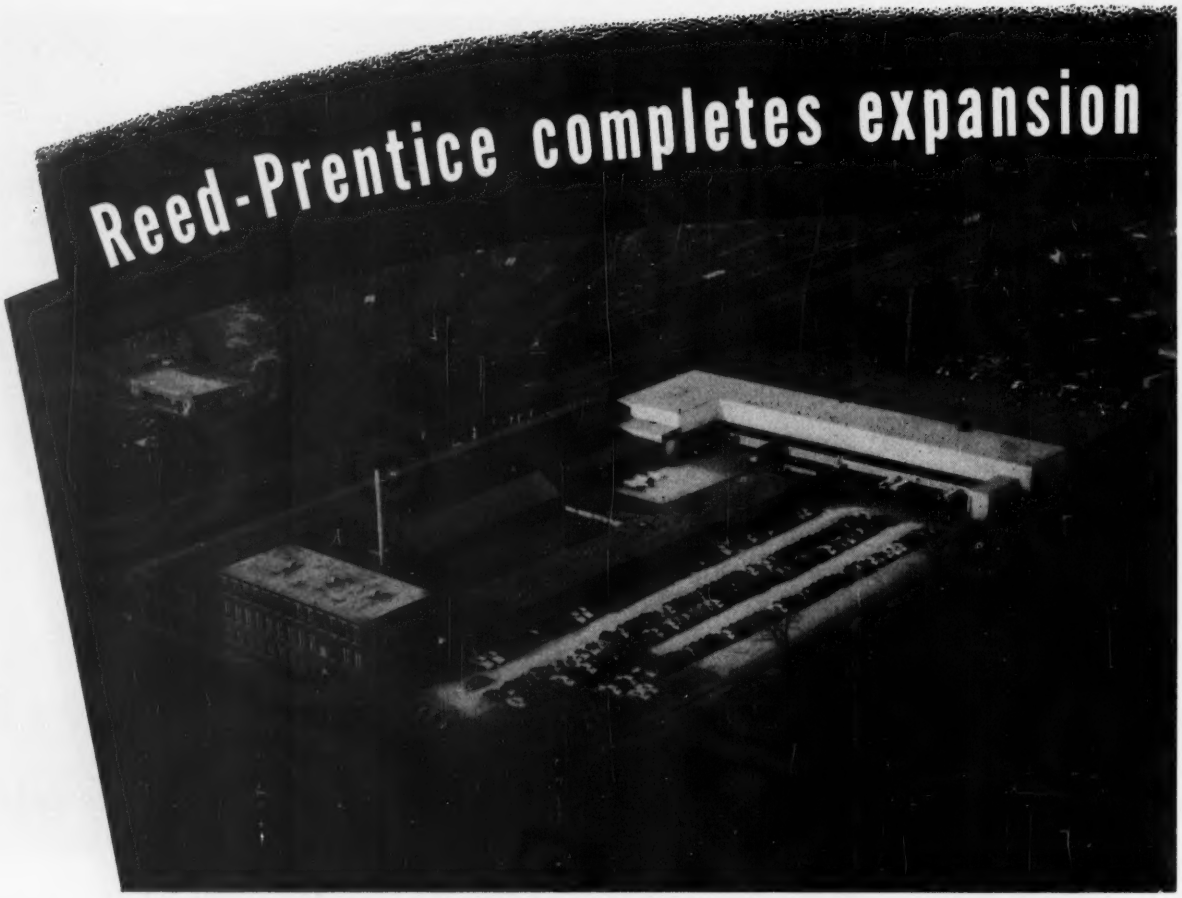
No. 91

Specify POPE PRECISION SPINDLES

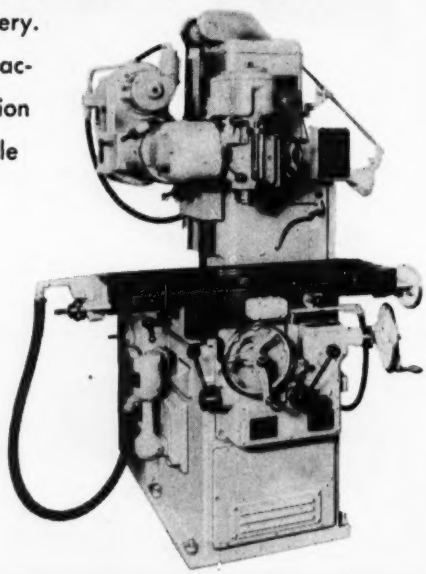
POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET :: HAVERHILL, MASSACHUSETTS



★ The completion of a new factory building gives Reed-Prentice a total of 240,000 square feet devoted to manufacturing precision machinery. Our steady growth is attributable to the world-wide acceptance of Reed-Prentice machine tools, plastic injection molding presses, die casting machines and portable power chain saws.



12V MILLER

Reed-Prentice No. 12V is a multi-purpose universal head vertical miller. The 12V offers complete versatility through infinitely variable electronic feed and speed controls. It is ideal for machining molds, dies, jigs and fixtures and can be supplied with electronic duplicating attachment.

MACHINE TOOLS

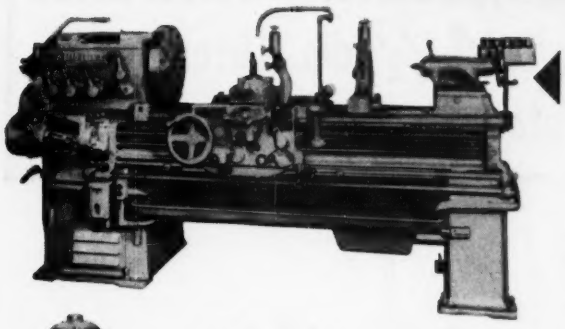
REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

MAIN OFFICE: 677 Cambridge St., Worcester 4, Mass.

BRANCH OFFICES: 75 West St., New York 6, N. Y.
1213 West 3rd St., Cleveland 13, Ohio
4001 N. Elston Ave., Chicago 18, Illinois
2842 W. Grand Blvd., Detroit 2, Mich.

for Greater Machine Tool Production!



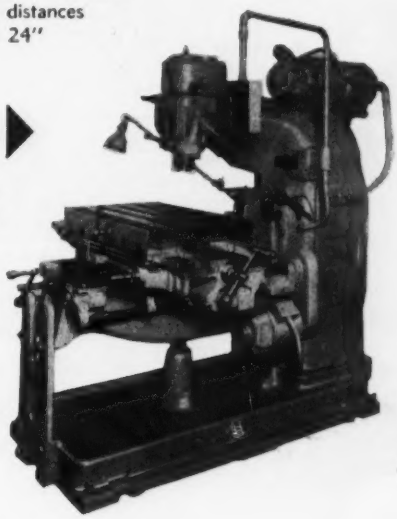
Engine and Tool Room Lathes

Reed-Prentice Sliding Gear Head Lathes are available in 14", 16" and 20" Engine models and in 14" and 16" Toolroom models. Rugged construction preserves alignment and assures accuracy. Center distances from 30" up in 24" increments.



22V Vertical Millers 22VS

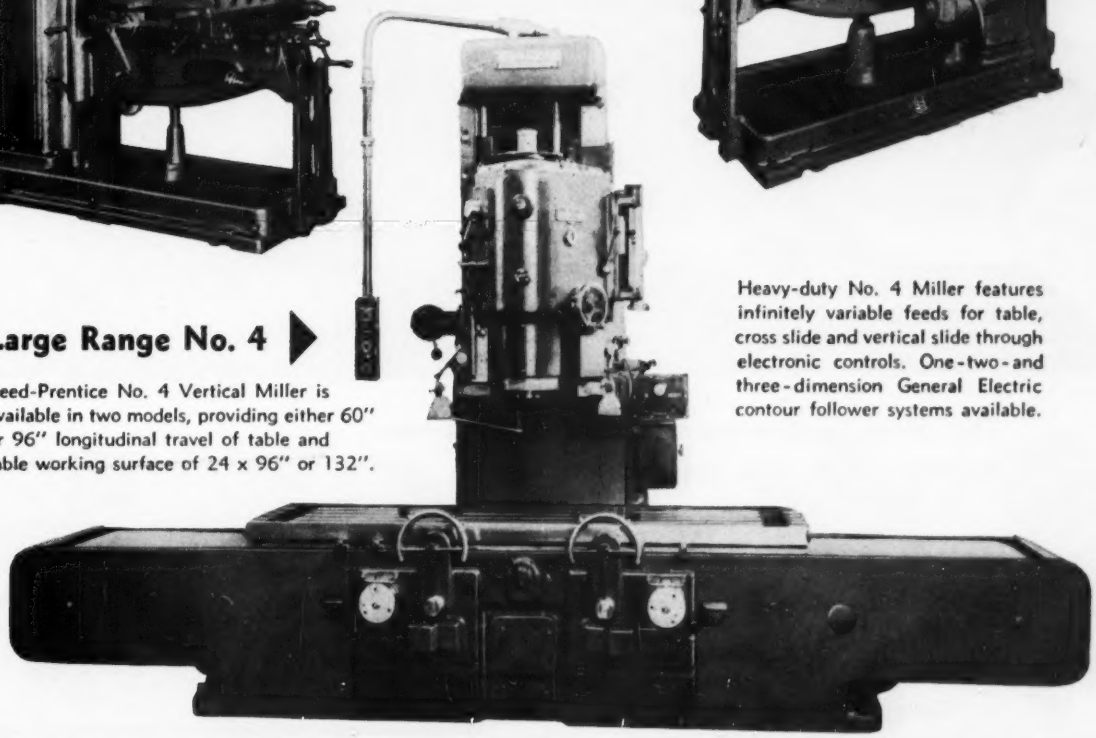
Reed-Prentice 22V and 22VS Millers that have 32 x 22" tables and 30" throat depth are unsurpassed for toolroom, die shop and general milling.



Large Range No. 4

Reed-Prentice No. 4 Vertical Miller is available in two models, providing either 60" or 96" longitudinal travel of table and table working surface of 24 x 96" or 132".

Heavy-duty No. 4 Miller features infinitely variable feeds for table, cross slide and vertical slide through electronic controls. One-two-and three-dimension General Electric contour follower systems available.

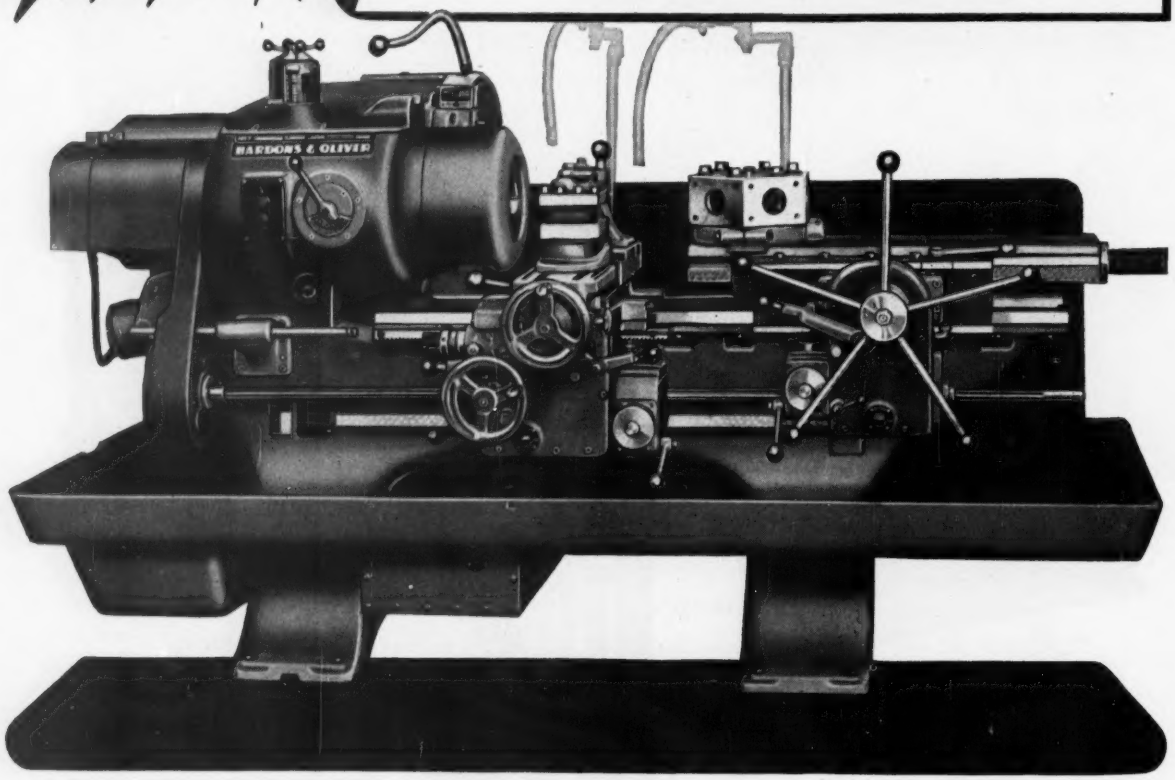


Machine Tool Representatives:

Philadelphia — Calco Machinery Co.
Buffalo — J. L. Osgood Machinery Corp.
Detroit — DoAll Detroit Co.
Grand Rapids — DoAll Grand Rapids Co.
Chicago — DoAll Mid-West Co.
Milwaukee — DoAll Wisconsin Co.
Minneapolis — Chas. W. Stone Co.
Houston — Preston Machine Tool Sales Co.
San Francisco — Montague-Harris Co.
Los Angeles — King Machinery Co.

NEW

BARDONS & OLIVER
Extra Capacity
No. 7 Ram Type Universal Turret Lathe
Takes up to 4½" dia. Through The Automatic Collet Chuck



The many improvements include more power, higher speeds, and increased rigidity.

• • • • • •

New bar support will adequately handle the weight of 4½" dia. solid bars. Automatic Collet Chuck and Bar Feed are hydraulically actuated.

Complete details on request.



BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO

It's No Problem...

TO FEED THIS BABY!

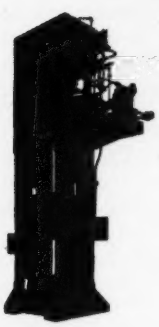


When you're W-S Equipt

It's a far cry from Arsenal, USA to Target, Korea. That's why it's essential, not *only* to make every shot count in the field, but in the factory, too . . . streamline and perfect every operation subsidiary to the main objective of a free world.

That's the kind of efficiency you are *sure* of when Watson-Stillman ordnance presses take over your cannon-fodder problem. Smooth, quiet operation, ultimate flexibility of control, minimized rejects, and the speed-*with*-efficiency required by modern warfare.

For *your* expanding ordnance requirements—consult Watson-Stillman first . . . experts in transforming *hydraulic* power into *fire* power.



Cold Extrusion Press



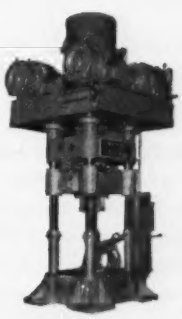
Shell Piercing Press



Shell Bonder

W-S HYDRAULIC

ESTABLISHED 1848



Shell Nosing Press



Billet Breaker

THE WATSON-STILLMAN COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

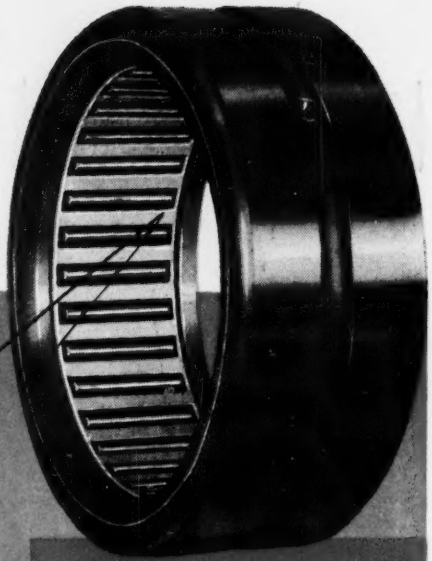
161 ALDENE RD., ROSELLE, NEW JERSEY

9-0-52

This ORANGE *Cage Design*

assures permanent alignment of rollers

--prevents roller skewing!





TRUE RUNNING IN ANY POSITION

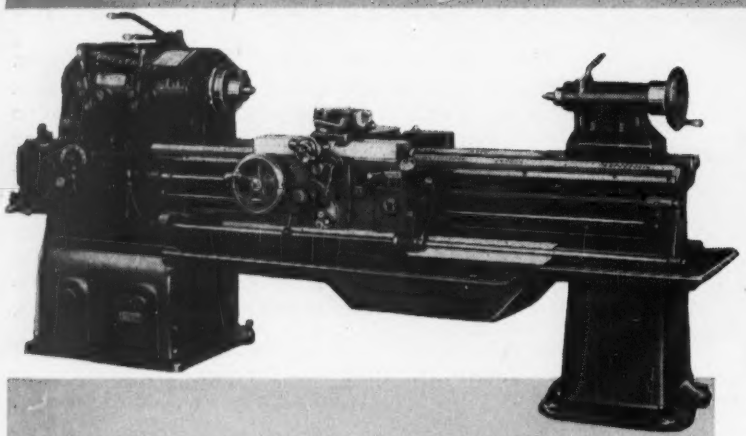
on

- --conventional applications
- --vertical installations
- --overhung mountings
- --relatively high speed applications
- --and are less affected by misaligned mountings and uneven loading.

ORANGE

Cage Type

NEEDLE BEARINGS



Meeting critical needs in Gear Box and Apron of 14"-16" BOYE & EMMES ENGINE LATHES

Orange Cage Type Needle Bearings are used as follows: One on the gear box center shaft—three in train gears from spindle to gear box—one in the apron. Boye & Emmes engineers selected these bearings "because of their high radial capacity, small outside diameter and comparatively large inside diameter." They report trouble-free performance from all machines in the field.

Orange Cage Type Needle Bearings provide the big advantage of high load capacity in small space—plus the additional feature of permanent roller alignment. This permits you to design needle bearings into many applications heretofore unsuited to other needle bearings.

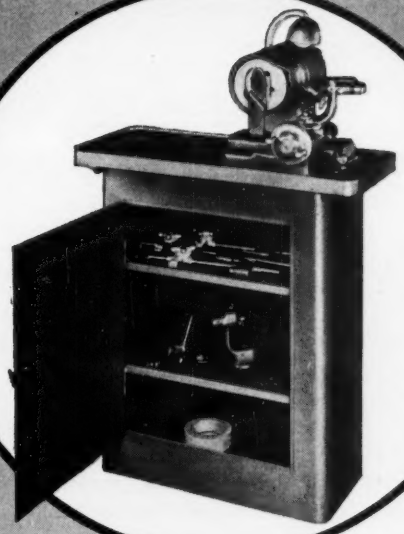
In the Orange cage design, square end rollers are retained in pockets of a free-floating, land-riding cage of anti-friction, non-ferrous metal. The cage merely guides—does not wear on rollers. All rollers and races are "Pentrate" finished to reduce corrosion and friction.

This combination of operating characteristics in Orange Cage Type Needle Bearings provides every installation with quiet, precision running and long, trouble-free service.

• **Write for Engineering Data Book showing construction, sizes, capacities, etc.**

ORANGE ROLLER BEARING CO., INC., 552 Main Street, Orange, N. J.

Get more than twice the usual life from your drills



CABINET-PEDESTAL
Available for mounting the No. 1-G Drill Grinder. Made from steel with wooden shelves. 31" high from floor. 13" x 30" top.



Eight times more holes per grind

Over 90% saving in drill cost

Gives even the smallest drill a production point that pays a profit

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

SELLERS NO. 1-G DRILL GRINDER

WITH BALL BEARING SLIDE

This small, self-contained, bench-type grinder embodies the sound features that have conclusively demonstrated their superiority in the larger Sellers Drill Grinders. Foremost among which are the basic principles and inherent accuracy of the Sellers Chuck and the Sellers advanced method of drill grinding. This grinder produces the Sellers point on a single drill or an exact duplication on as many drills as are required. It grinds right hand 2 lip twist drills from .028" (No. 70) up to ½" diameter to any included angle of point from 80° to 160°. Designed with ball bearing slide, ball bearing swing frame and quick-adjusting tail center which combined provide increased accuracy, reduced wear and further simplification of operation and adjustment. Sellers Drill Grinders are built to last. Part replacements are negligible, however, if required, replacement parts are always available. Complete information will be furnished upon request.

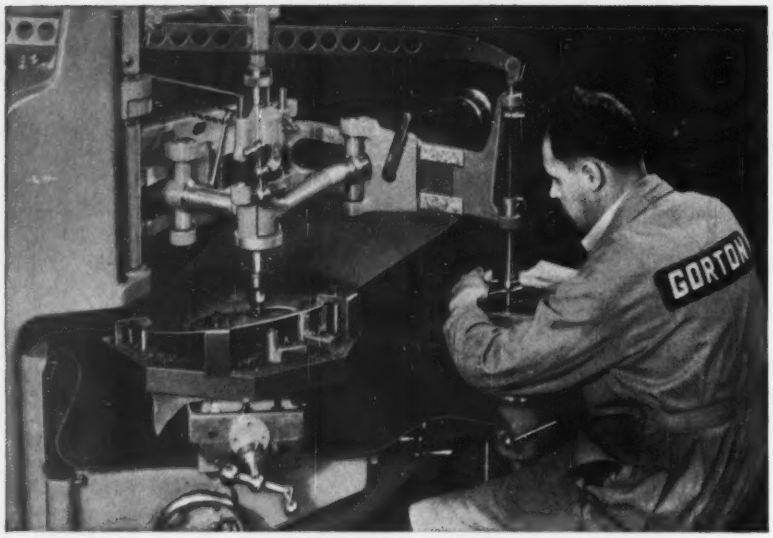
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

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CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW —

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

— in the sense that industry at large and Metal Working people in particular are just beginning to appreciate the many advantages Pantography offers to those faced with the Design-Production problems of today and tomorrow.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1303 Racine Street, Racine, Wisconsin, U. S. A.



New Counterbore

with interchangeable pilots



Photograph by Morton Berger

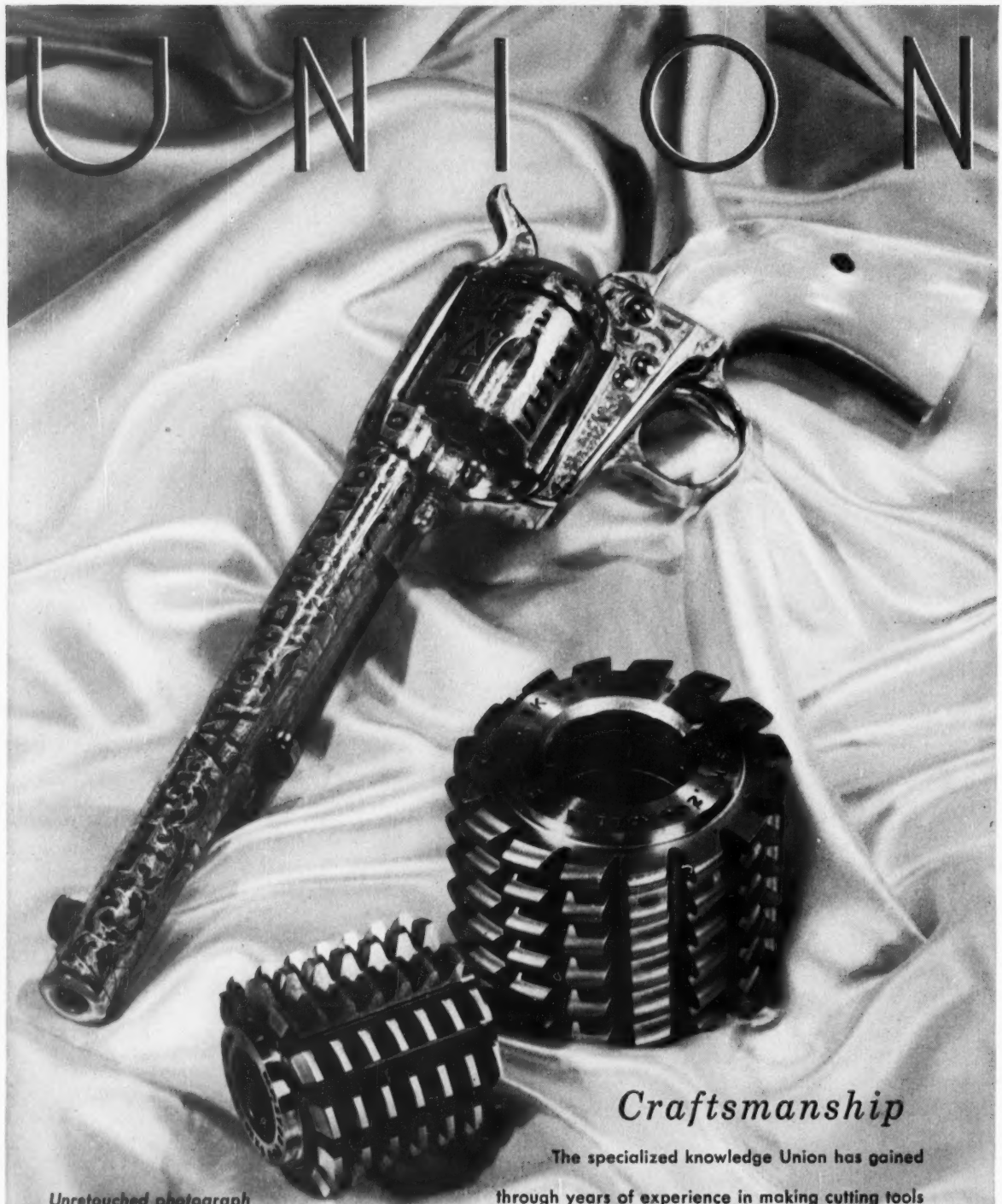
Introducing the Butterfield High Speed Counterbore and Spot Facer in standard and aircraft designs . . . latest example of Butterfield craftsmanship. *Ask your distributor.*

BUTTERFIELD

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

DRILLS • TAPS • DIES • REAMERS • COUNTERBORES • SCREW PLATES

UNION



Craftsmanship

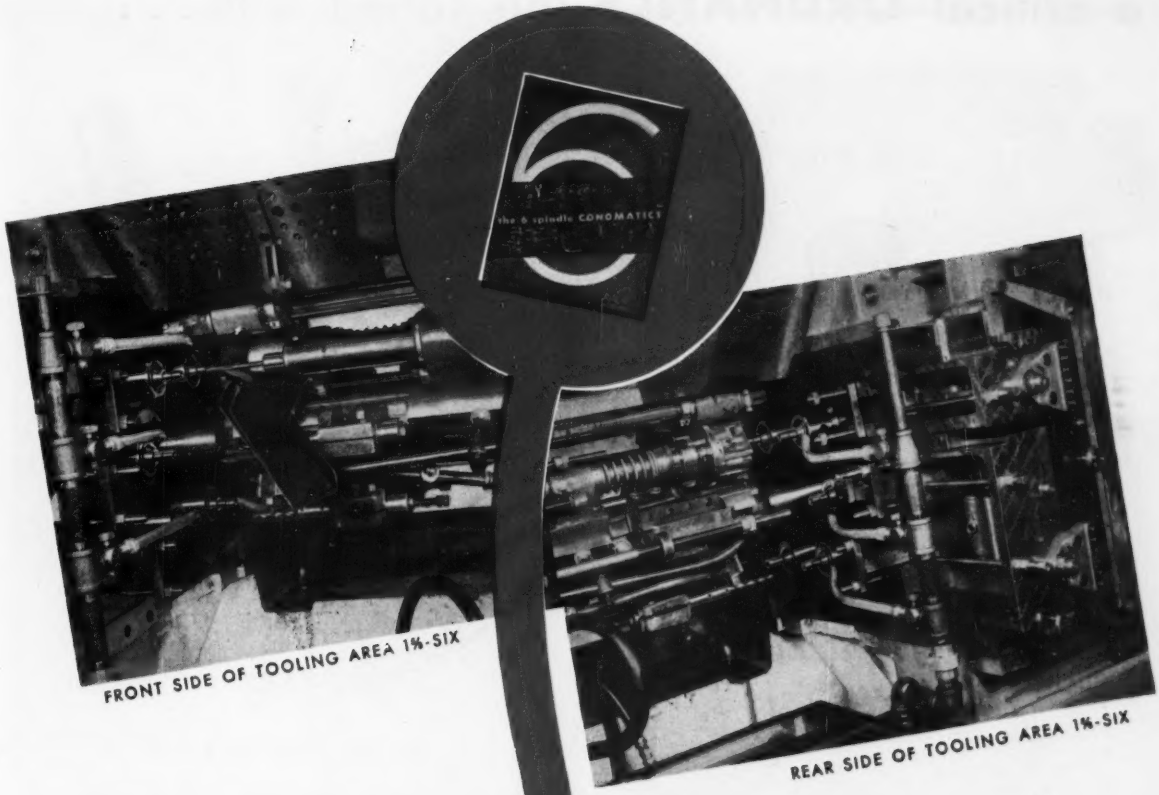
The specialized knowledge Union has gained through years of experience in making cutting tools is applied to every individual design it turns out.

Unretouched photograph by Morton Berger

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec



THE IMPORTANT REQUIREMENT

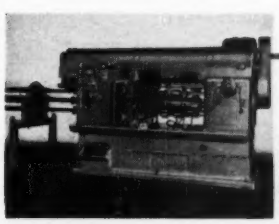
All brands of multiple spindle bar automatics offer value or they would not be on the market. If it were possible to engineer and incorporate the superior qualities of all into one machine, certain features would still be considered more important than others in accordance with the individual buyer's requirements.

But there is one essential quality required of all brands—regardless of the job. It is *dependable, low cost performance!* CONOMATIC users know well its benefits. But you don't have to be a user to know about this feature, or any other feature, of the CONOMATIC. Just write, wire, or phone for the information. There is no obligation.



Cross drilling without costly spindle stopping is one of many CONOMATIC innovations which make use of the machine's unexcelled accommodation to tools and work. But any such facility that saves secondary handling is valuable only because of the more important "built in" qualities that keep the machine running.





A Comparison of ALL Automatics is in favor of Cone

Conomatic CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

a critical **ORDNANCE** job solved with . . .



die
BY MOORE SPECIAL TOOL CO.

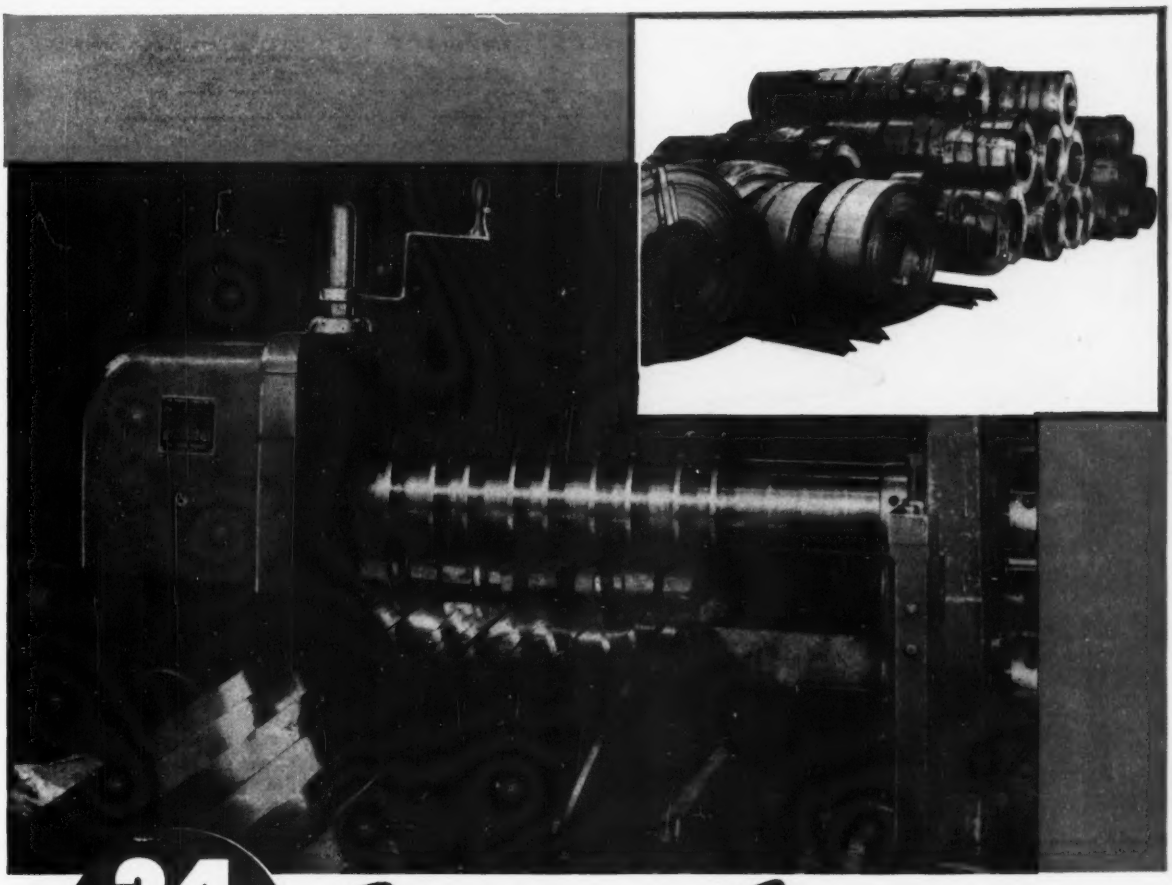
die set
BY **PRODUCTO**

Millions of small ordnance fuse component springs stamped exactly right. Tolerance between punches and dies is maintained thru 18 stations at .0005" . . . only the top quality of Producto Die Sets makes such accuracy possible.

OPERATIONS: Piercing, forming, blanking.
SIZE OF PIECE: 1¼" long, ⅛" wide.
MATERIAL: .012 spring steel.
PIECES PER GRIND: 100,000.
PRODUCTION: 9,600 pieces per hour.

For definite dollar savings, maintained accuracy and highest production, specify "PRODUCTO" . . . approved by the country's leading manufacturers.

the **PRODUCTO MACHINE COMPANY**
985 HOUSATONIC AVENUE • BRIDGEPORT 1, CONNECTICUT



24 HOUR *Slitting Service!*

If you operate a slitter of your own, you may always enjoy this kind of service. Think what a blessing it is to be able to meet expected and unexpected needs for slit strands on such short notice—how greatly it simplifies production planning—how it eliminates production bottlenecks and minimizes strip inventories.

Then, too, when you buy strip in standard widths, your strip supply sources are more numerous. You buy wherever you get the best delivery, price, and quality.

Slitting service now may cost you anywhere from $10.00 to $100.00 or more per ton. Even if your needs were only 50 tons per month, at an average of $20.00 per ton for slitting, the cost per year would be $12,000.00—an amount which alone may be more than sufficient to make a Yoder slitter highly profitable.

The Yoder Slitter Book (sent on request) analyzes and discusses the economics as well as the mechanics of slitter operation. Yoder engineers will be glad to study your needs and submit recommendations as to kind, size, and cost of suitable slitting equipment.

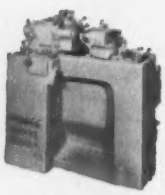
THE YODER COMPANY • 5504 Walworth Avenue, Cleveland 2, Ohio

Complete Production Lines

- ★ **COLD-ROLL-FORMING** and auxiliary machinery
- ★ **GANG SLITTING LINES** for Coils and Sheets
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ENGINEERING YODER MANUFACTURING

bryant
internal grinding



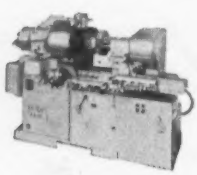
no. 1309-W

Finishes 2 bores and a taper straight and concentric. 2 wheelheads are used on this semi-automatic. Max. traverse stroke, 6". Max. grinding length, 3½".



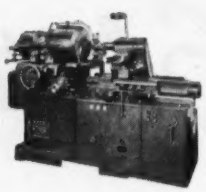
no. 1109

For high production of small bores where accuracy of size and finish are required. Max. traverse stroke, 6". Max. grinding length, 3½".



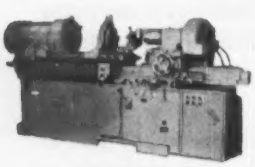
no. 1316

Two wheelheads for high production of jobs requiring face and bore, or face and O.D. grinding. Max. traverse stroke, 20". Max. grinding length, 8".



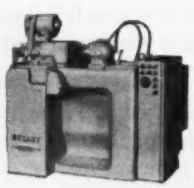
no. 1116

A general purpose hole grinder for tool room, small shop, or general production. Maximum traverse stroke, 20". Maximum grinding length, 8".



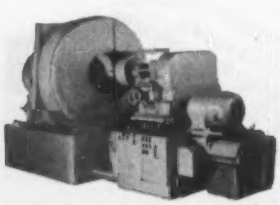
no. 1416

Specially designed for grinding bores in long work, such as machine tool spindles. Maximum traverse stroke, 20". Maximum grinding length, 8".



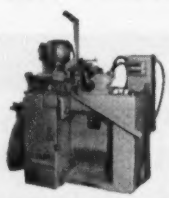
no. 1209

A fully automatic, high production machine for small and medium bore grinding. Max. traverse stroke, 6". Max. grinding length, 3".



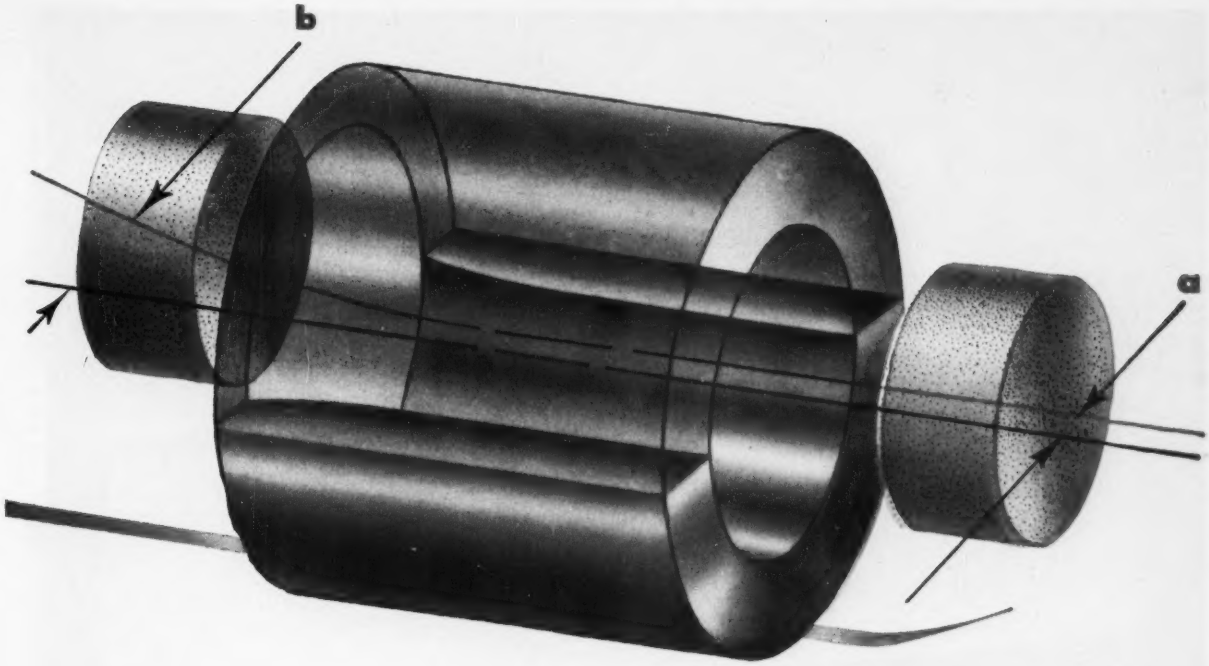
no. 1460

For production or single piece hole grinding on parts up to 60" diameter. Max. traverse stroke, 21". Max. grinding length, 16".



no. 2209

For precision and high production grinding of ball bearing races, gears, rolls, bushings, etc. Max. traverse stroke, 6". Max. grinding length, ¾".



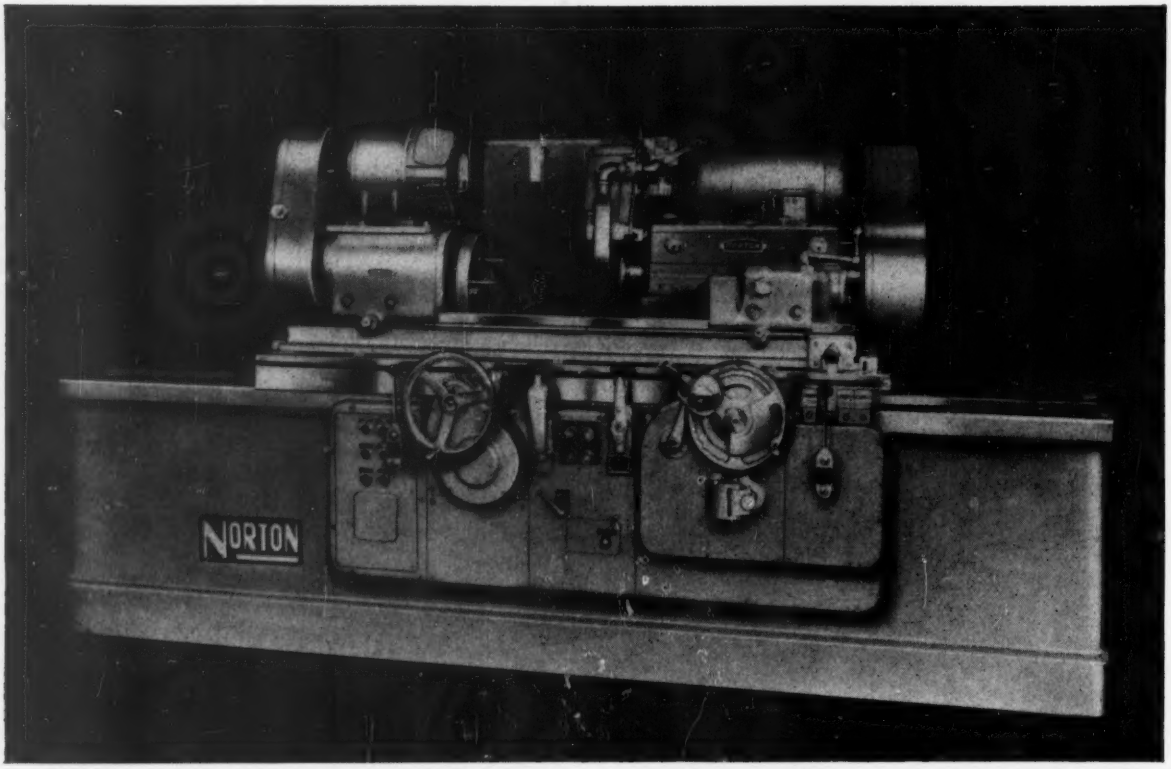
BELL mouth holes are a common internal grinding error. General available information advises simply turning the workhead or changing the length of traverse to correct this error, to generate a straight hole. In the case illustrated above, where bell mouth exists at one end of the hole, neither turning the workhead nor changing the length of stroke will correct this error.

In order to grind a straight hole the wheel must traverse the work in a straight line parallel to the axis of the work. The wheel path (the line in which the wheel traverses) is controlled by the slides under the wheelhead. If the slides are straight and true, the wheel path will be a straight line. If the path of the wheel varies from a straight line, the variation will be generated in the work.

At point "a" the wheel path and axis of the work are parallel and the wheel is set to grind a straight hole. Because of an error in the wheelslide ways, the wheel path is distorted and the wheel is plunged into the back end of the work and the wheel path and work axis diverge as shown at point "b". Wheelslide error can introduce distortion of many types within the work in addition to the one illustrated. The remedy is to correct the wheelslide ways which will, in turn, straighten the wheel path. The wheel contact will be improved, resulting in better finish.

Bryant Chucking Grinder Company
Springfield, Vermont, U. S. A.

Internal grinders • Internal & External thread gages



NORTON 10" TYPE CTU SEMIAUTOMATIC GRINDER is first choice in production lines and in job shops. No other cylindrical grinder offers you such a unique combination of speed, accuracy, flexibility and sturdiness. No wonder users have reported that Norton 10" CTU's have doubled production . . . replaced 2 or 3 machines . . . eliminated extra operations . . . made operators more productive . . . and have given them the "Touch of Gold". *Catalog No. 1787* has complete data on sizes, advantages, features and optional equipment that help you put extra profits into your production. It will pay you to look into the high-speed, high-finish grinding this machine makes possible.

These cylindrical grinding machines give you "TOUCH OF GOLD" value . . . in your profit margins

The Norton CTU is such a money-maker it brings you the touch of gold. It adds value to each piece of work it handles — and it actually cuts the cost of grinding . . . thus adding to your product profits.

It's easy to see why. Your operator loads the work . . . *touches one lever* . . . and stands by while the machine does the rest . . . as easy as 1-2-3.

Work is automatically ground to size under electric timer control . . . and the wheel head resets itself for the next cycle.

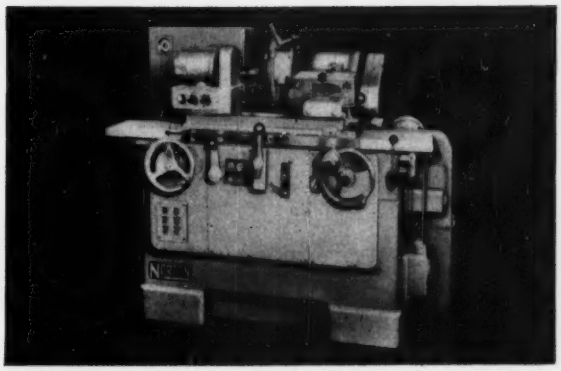
All three basic Norton CTU Semiautomatic Grinders: 4", 6", and 10" offer you the same advantages over their different ranges of work sizes. You can also get the 6" grinder with a 10" swing and the 10" grinder with a 14" swing by specifying Type LCTU. The Norton line of Type CTU Cylindrical Grinders also includes plain machines for traverse grinding. Your Norton Representative will be glad to help you choose the one that best fits your requirements.

Norton Cylindrical Grinding Machines are just one phase of *the world's most complete line of grinders and lappers* . . . products of Norton's engineering leadership in the development of both grinding wheels and machines.

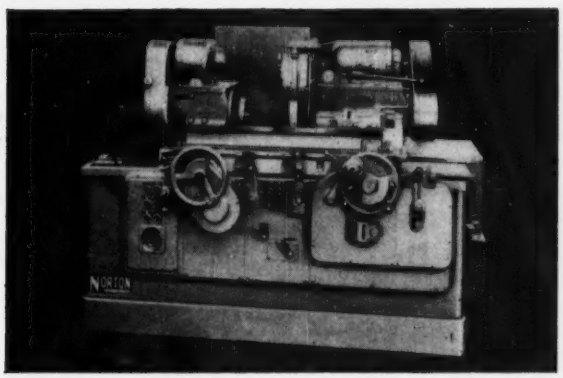
Remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost . . . to have that "Touch of Gold."

Norton welcomes opportunities to work with you on the planning level to fit standard or special grinding machines into your immediate plans or for "post emergency" production.

For complete information, see your Norton Representative or write us direct for the catalogs listed under the machine illustrations. NORTON COMPANY, Machine Division, Worcester 6, Mass.



NEW NORTON 4" TYPE CTU Semiautomatic Grinder in 12" and 18" work length capacities now makes it practical for you to apply high-finish grinding for adding value to small parts. *Catalog No. 531* gives you full details.



NORTON 6" TYPE CTU Semiautomatic Grinder, in 18" and 30" work length capacities, has a performance record that's worth investigating. *Catalog 1488* tells the whole interesting story.

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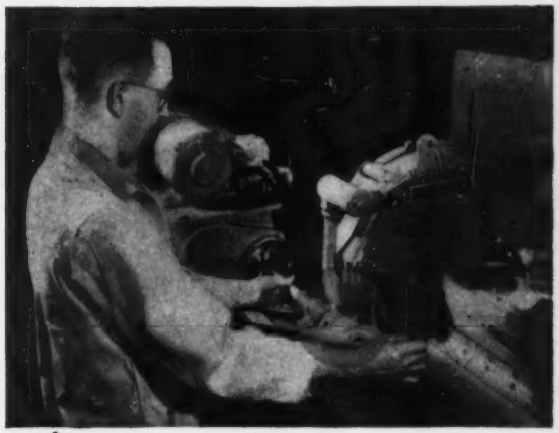
NORTON

GRINDERS and LAPPERS

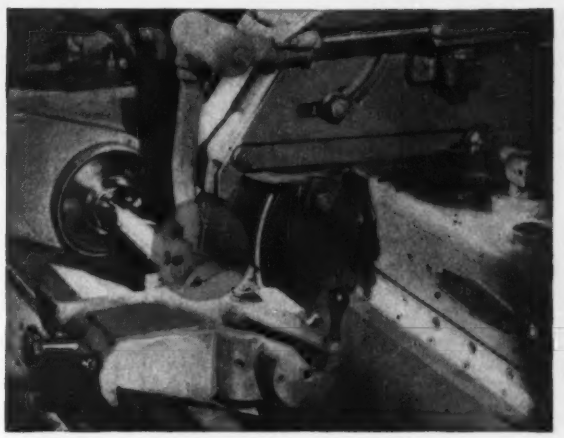
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EASY AS 1-2-3



1. Operator loads machine and touches starting lever.

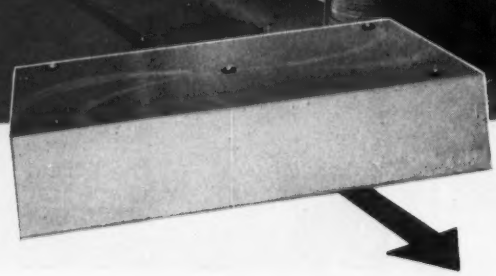


2. Machine automatically grinds part to required size and finish — while operator attends another machine.



3. Operator unloads machine.





Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.



Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**


SCENE 96:
"Accuracy Counts!"
... an actual scene from the GTD-Greenfield sound film "FACTS ABOUT TAPS AND TAPPING"
VOICE: "Good gaging technique is essential to insure interchangeability of threaded parts ... Here we see a plug gage used to make sure that threads are held within the GO and NOT GO limits set by the designer ... It pays to use guaranteed accurate gages ... Remember, a poor gage that rejects good products is an expensive tool."
GREENFIELD
TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
This 26-minute full-color motion picture "FACTS ABOUT TAPS AND TAPPING" is now available for group showing through your local GTD-Greenfield distributor.



CLOSE-TO-SHOULDER THREADING . . WITH REGULAR CHASERS!

Style DJ Solid Adjustable GEOMETRIC Die Head is compact and very short — designed to swing in limited tooling space. What's more, it has no face plate, so that regular chasers protrude enough to permit close-to-shoulder threading.

This handy die head permits quick adjustment to decimal sizes and various classes of threads. Chasers may be changed for different diameters and pitches too! The DJ head is ideal for short-length threading where quick back-off eliminates need of a self-opening head. Twelve sizes cover #0 to 6" diameter range.

Write for full details. Specify Bulletin DJ

Greenfield Tap and Die Corporation

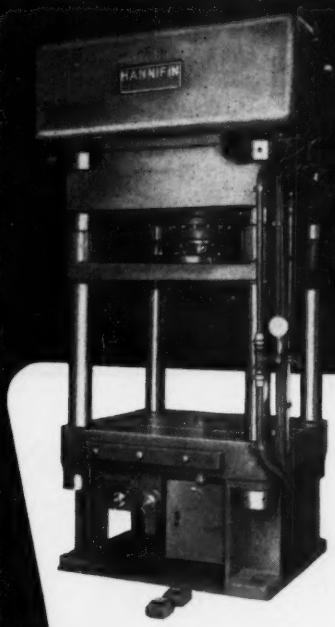
GEOMETRIC TOOL COMPANY DIVISION

NEW HAVEN 15, CONNECTICUT

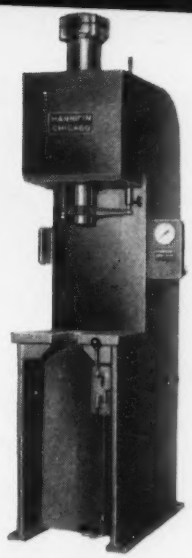
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FROM ½ TON TO 150 TONS...

You name the job We have the Press!



150-Ton Four-Column Press—a standard Hannifin design with semi-automatic cycle. Advance at high speed, feed stroke starting at pre-set point in stroke and automatic reversal. Dual electric push button control.



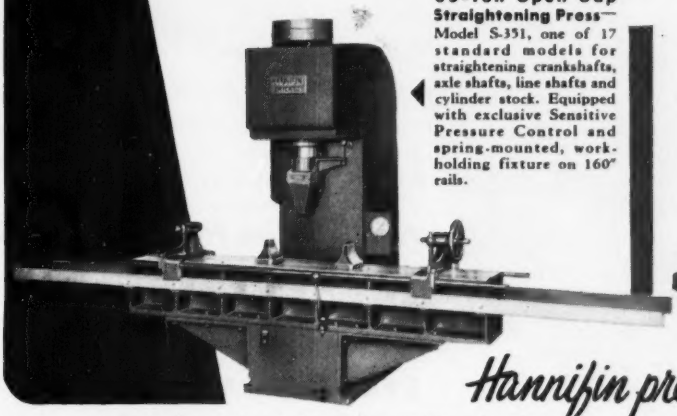
15-Ton Forcing Press—with built-in hydraulic power unit and exclusive, patented Sensitive Pressure Control. Gap, 22"; stroke, 21"; reach, 10"; table, 19" x 22" with U slot.

Molding, straightening, forming . . . assembling, riveting, punching, staking, marking . . . there is a broad variety of vitally important production functions best handled by one of the many Hannifin standard presses. For each has the easy, sensitive and safe control, the dependable, efficient operation and the rugged strength that mark it as a leader.

The Hannifin line includes more than 75 standard models of fast, self-contained presses. It's easy to find one that fits your requirements. Special adaptations in stroke, gap, clearance or controls are easily made in most models.

To find out what Hannifin Hydraulic Presses we have for you, fill in and mail the coupon. It will bring specific information . . . promptly!

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½-Ton and 1-Ton Air-Operated Han-D-Press—designed to meet high production schedules on assembling, staking, riveting, punching, marking and pressing. Electric control for hand or foot operation.

Hannifin presses make it Easy



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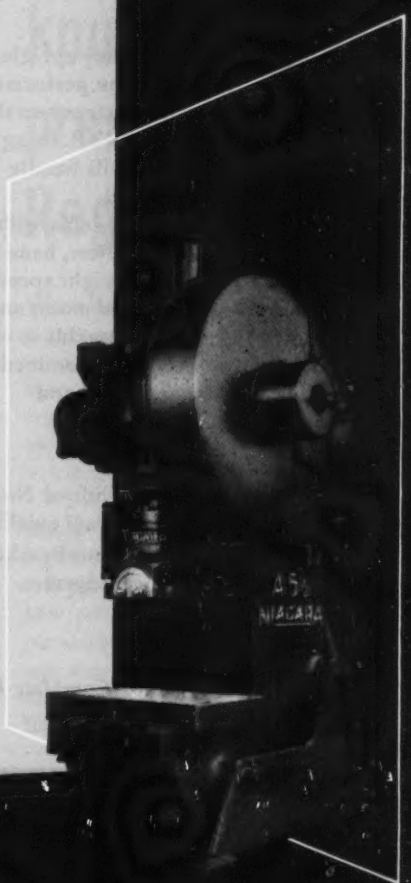
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Electrically Controlled Air Actuated SLEEVE CLUTCH

PROVIDES ECONOMY AND EFFICIENCY OF OPERATION for presses with high frequency clutch engagement

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- **HAS NO FRICTION SURFACES** to heat up or wear.
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- **PROVIDES INSTANT ENGAGEMENT OR DISENGAGEMENT** at any point in the stroke.
- **CAN BE SINGLE STROKED, JOGGED** or operated continuously.
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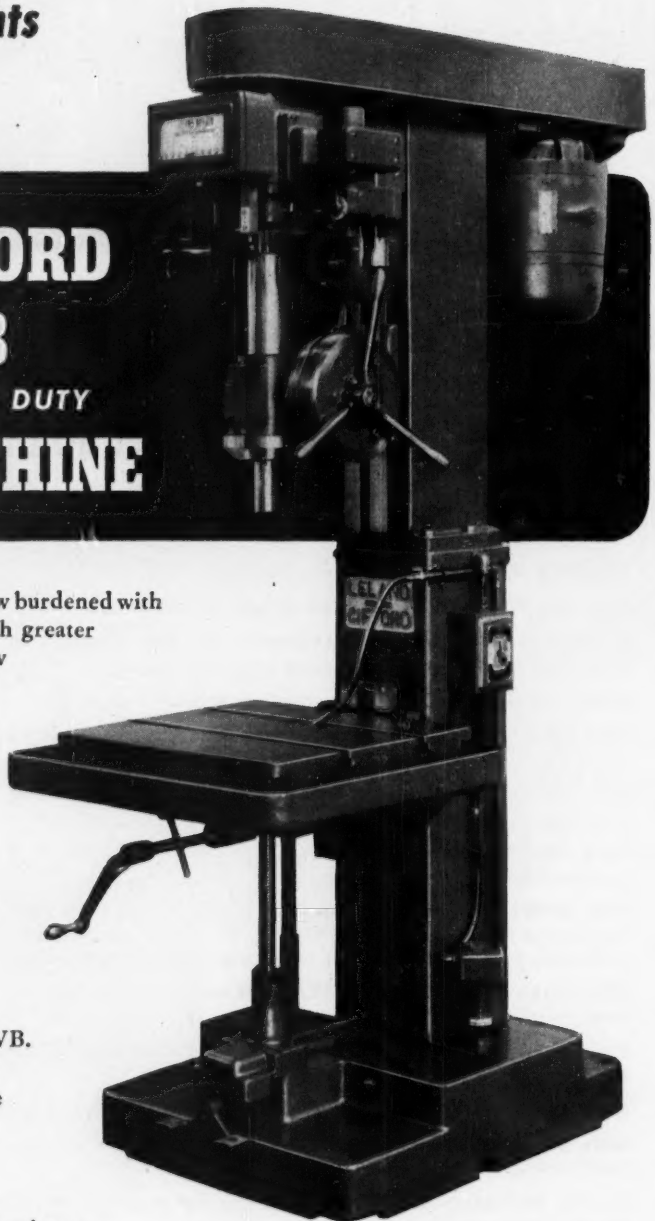
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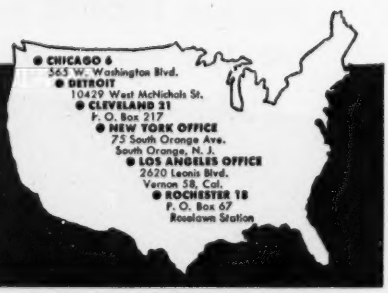
DRILLING MACHINE



Many a radial or heavy duty upright is now burdened with operations which can be performed with greater speed, economy and efficiency on the new Leland-Gifford No. 3 MVB. Rugged, powerful, versatile, it will handle holes up to 1¼" in steel or 1½" in cast iron. Available with one to four spindles; power, hand or hydraulic feed; two or eight speeds with single or four speed motor and back gearing — it is adaptable to any general purpose or mass production drilling, tapping, reaming and counterboring assignment.

Look into the Leland-Gifford No. 3 MVB. It will not only pay for itself quickly — but give you an extra bonus by taking the load off more costly equipment.

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LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U. S. A.

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Largest knuckle-joint press in the world: bed area of 60" x 70", 40-inch die space, and six-station Bliss ratchet dial feed, 59" dia., with electrical protection for safer indexing.

Bliss builds world's largest knuckle-joint press for Regal Ware, Inc.

When Regal Ware, Inc., Kewaskum, Wis., needed a press to coin cups for artillery shell cases, one press builder recommended a 6000-ton hydraulic. Bliss, who builds both mechanical and hydraulic types, found that a 4000-ton knuckle-joint press would not only deliver higher production but would also cost much less.

Result: Bliss created the largest knuckle-joint press ever built, a giant standing 34 feet and weighing 305 tons.

Regal Ware's experience is a good example of how press buyers can count on Bliss' unbiased recommendations. For Bliss builds more types and sizes of mechanical and hydraulic presses than any other manufacturer. Call in your nearby Bliss sales engineer today.

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Formbrite's superfine finish eliminated buffing on these parts



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With Formbrite's superfine grain structure and added surface hardness, why not *tumble* these bows—by the thousands.

It was as simple as that. Formbrite's clean, smooth surface produced a jewelry finish—ready for gold-plating and lacquering. Since these bows are produced by the millions, the savings effected were substantial.

Formbrite, just in case you haven't heard, is a superior drawing brass. Comparative tests prove conclusively that the superfine grain structure of this specially processed forming brass means stamped and formed products that are stronger, harder, "springier" and more scratch-resistant. Yet the metal is so ductile that it can be readily formed, drawn and embossed.

Time studies made of finishing operations have shown that a bright, lustrous finish ordinarily can be obtained by a simple "color buffing" operation—or by tumbling, if the product lends itself to this method.

And yet, Formbrite costs no more. Convince yourself that Formbrite is the metal for your product. Write for Publication B-39. Address The American Brass Company, General Offices, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.

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Pressure Processing

. . . whoever uses it in their production is a customer or potential customer of **H-P-M**



DIFFICULT SMALL PARTS call for H-P-Ms!

For difficult draws and other forming operations . . . on short as well as long runs . . . Walker Mfg. Company, Ajax Division, finds H-P-M 150 and 200 ton All-Hydraulic Presses ideal.

Starting with one H-P-M, Walker has added three more to keep pace with increased production requirements . . . reflecting real confidence in H-P-M and the presses we build.

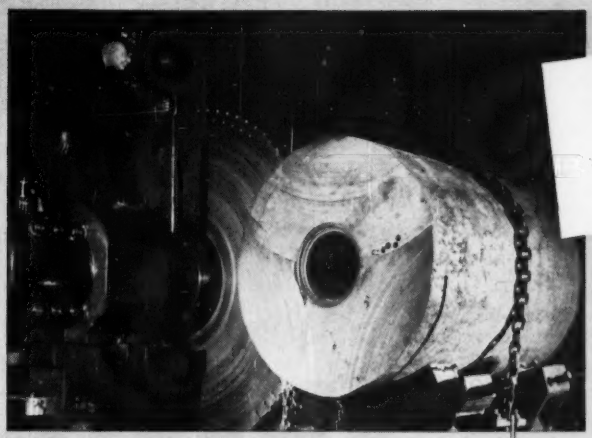
If pressure processing is an important part of your production picture . . . it will pay you well to talk shop with an H-P-M engineer. Write today!

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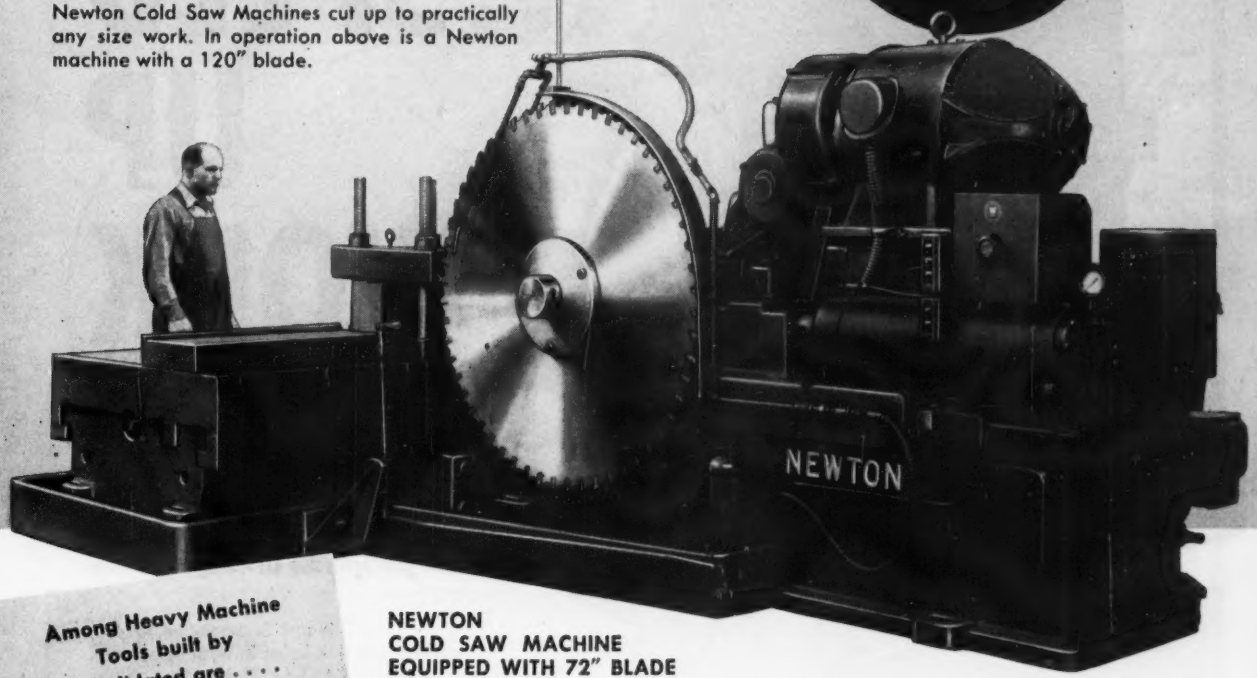
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Newton Cold Saw Machines cut up to practically any size work. In operation above is a Newton machine with a 120" blade.

Save on your heavy cutting time through faster smoother operation

NEWTON HYDRAULIC FEED COLD SAW MACHINES



NEWTON COLD SAW MACHINE EQUIPPED WITH 72" BLADE

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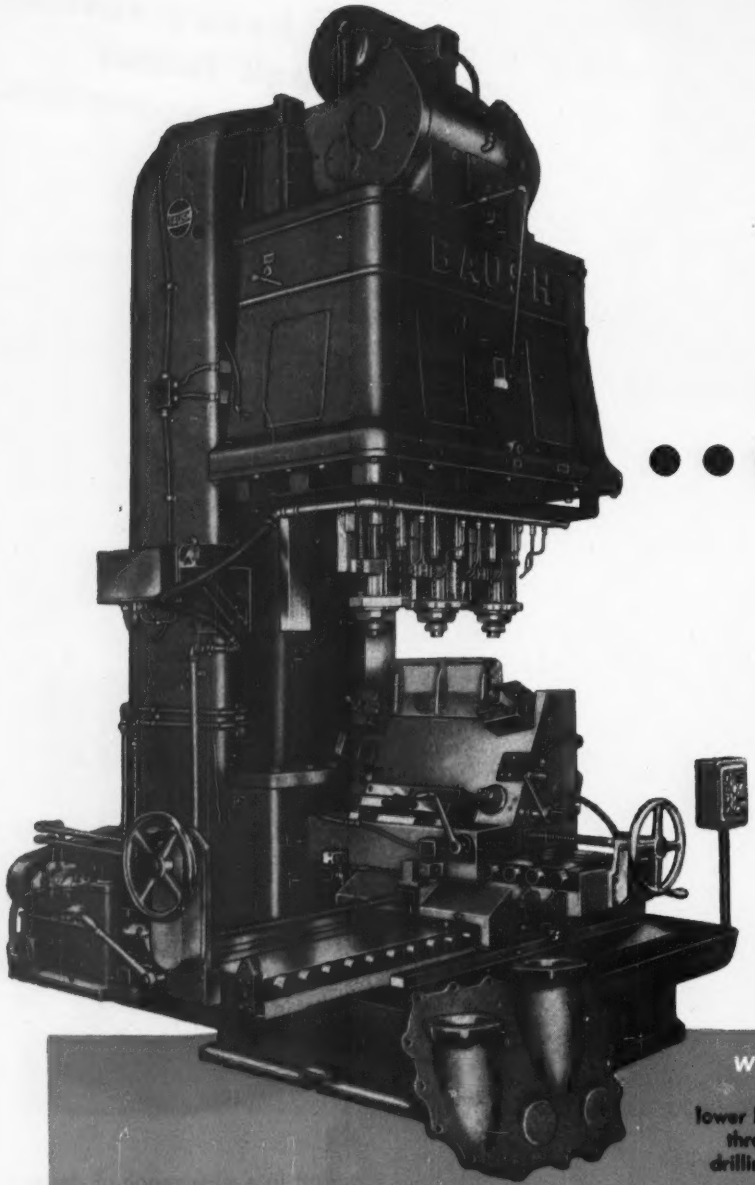
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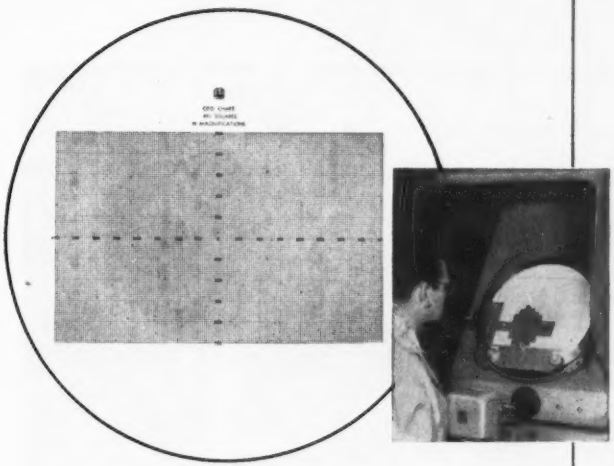
What it does: This unit is arranged to drill and countersink holes in both upper and lower bosses of heavy CAST STEEL housings. It has three (3) groups of spindles to perform fourteen drilling and countersinking operations in three (3) successive work positions:

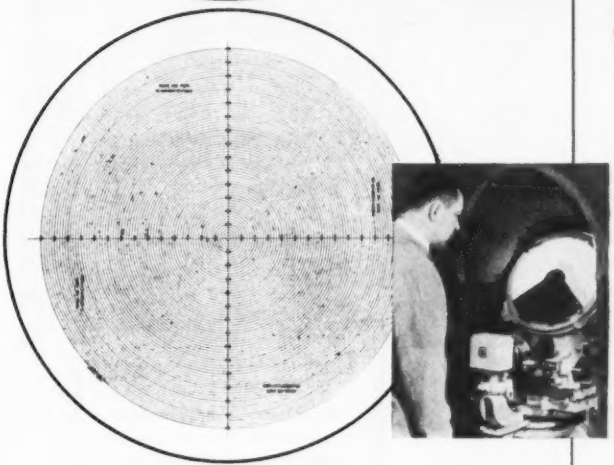
Position #1 — Drill two (2) holes ¾" dia.
Position #2 — Drill six (6) holes for ½ x 13 tap
Position #3 — Countersink six (6) holes for ½ x 13 tap

Both machine and fixture are designed to handle either R.H. or L.H. housings.

How it does it: Parts load into fixture out from under head to the left of machine. Parts set against an angle plate type fixture, locating from two (2) moveable pins which enter the reamed construction holes and are clamped to plate with planer type clamps. Fixture proper is mounted on a double slide, (left to right and front to rear), which is positioned by hand operated electrically interlocked shot bolt. Slide operates by screw and hand wheel. Individual bushing plates are furnished at each work position with guide bushings for all the tools. These plates rest on the fixture and pick-up in the part for location.

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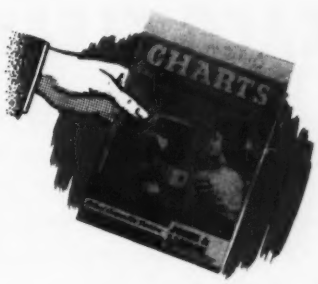
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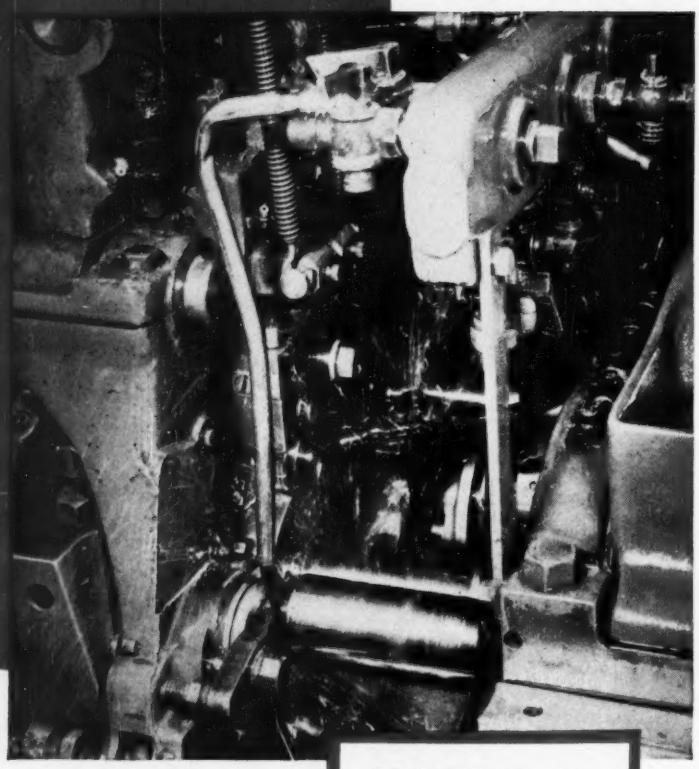
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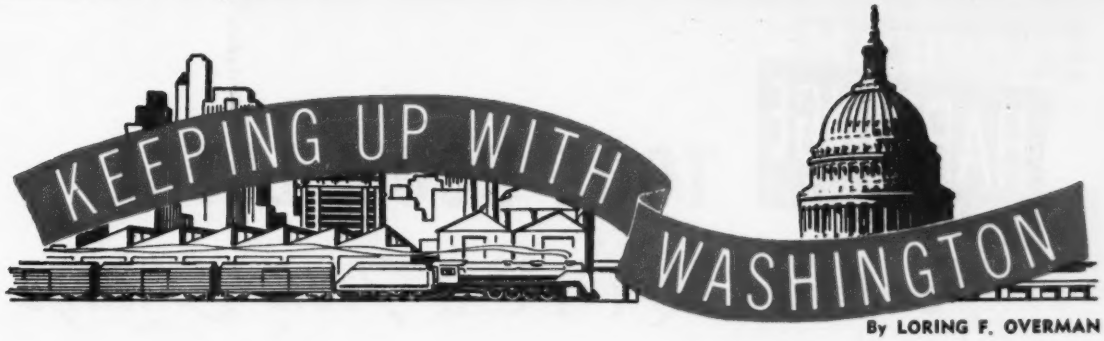
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By LORING F. OVERMAN

Projects of Prime Importance to Equipment Manufacturers

AS the new Administration began to move the levers and push the buttons of government, three projects were of particular significance to the machinery industry. Probably first in importance was the Vance Report, which proposes a new government policy—a plan whereby production capacity will be substituted for the stockpiling of military end items. The second was Defense Mobilization Order No. 24, which fixes policy and agency assignments for maintaining the "mobilization base."

The third project, still in the discussion stage, was the proposal of Representative Herbert C. Bonner, that there be named an Undersecretary of Defense for Procurement. His suggestion, embodied in a bill deposited with the Clerk of the House, would make the new undersecretary the biggest single purchasing agent-contractor-storekeeper in our history. The Munitions Board would be abolished and its function transferred to the undersecretary. In addition, all military and naval procurement, production, storage, and distribution would be under the new office.

The Vance Report

As forecast in a preliminary report last September, the so-called Vance Committee (the Advisory Committee on Production Equipment) had much to say in mid-January about the advisability of building plant capacity and machine tools rather than stockpiling military end items. The seven-man Committee, headed by Harold S. Vance, president of the Studebaker Corporation, observed that an additional one to two billion dollars in production equipment would be needed to support military operations on a theoretical "M" (Mobilization) Day as now projected.

The Committee concluded that military equipment becomes obsolete much faster than production equipment, and that the capacity to produce costs much less than actual stockpiling of military items. In the event that the end items are not needed, the production equipment cost would represent only a fraction of the cost of outmoded end items. The Committee also observed that the existence of a vast pool of production equipment could serve as a deterrent to hostilities, since our country's ability to produce is heartily respected by all potential enemies.

THE Report of the Vance Committee stressed the importance of a healthy production equipment industry, and outlined several steps considered necessary to achieve the goal. The Committee fixed the value of 550,000 government-owned pieces of production equipment at approximately $6,000,000,000 (replacement cost), and estimated a 5 per cent annual charge for depreciation.

"Hence," said the Report, "an annual volume of roughly $300,000,000 worth of machine tool business should originate from the Government alone if this valuable asset is to be maintained and kept up-to-date." The Report also pointed out as "shortsighted" the Government's dumping, following World War II, of a large number of modern items of production equipment. As a result, the annual output of the machine tool industry dropped to $250,000,000 in 1949.

"If this shortsighted policy is not repeated after the present emergency is over, or when current contracts are completed, we estimate that the normal commercial demand for replacement of obsolete and worn-out tools and for expansion should supply a minimum of $300,000,000 worth of machine tool business per year," the Vance Report estimated. "Adding to this the $200,000,000 to $500,000,000 per year needed to establish the mobilization base raises to a possible $800,000,000 the amount of annual machine tool business to be transacted during the next few years."

IN its final observation, the Committee urged that the Secretary of Defense require the timely coordination of the three military services with the manufacturing industry to insure that the most modern equipment, materials, and methods will be available for the production of military equipment.

"Too often," the Report stated, "the problem of efficient production is given little or no consideration until the item is fully developed and design and specifications fixed. At best, a further delay ensues while production problems are being resolved. Concurrent development of manufacturing processes and tools along with the design and development of new weapons is highly desirable . . . A second area requiring greater emphasis is research in the field of new production processes and equipment, particularly as new materials are developed. The heavy press program and developments in precision casting and forging are illustrative."

Defense Mobilization Order No. 24

A plan based on some of the Vance Committee's recommendations is outlined in DMO No. 24, effective January 17. It concedes that a mobilization base "must be maintained so as to permit prompt use in time of national emergency." After concluding that government-owned facilities will be maintained as provided by law, and that the profit motive will look after those having commercial usefulness, the Order outlines methods of caring for private facilities which become non-supportable when defense contracts end and private plants in which government equipment has been installed.

The government agency responsible for the facility is required to make decisions regarding the maintenance of the equipment. Lists of the facilities were to have been submitted to the Administrator of the Defense Production Administration by February 1, and may be supplemented from time to time.

THE purpose of reporting to DPA is to establish a single central authoritative list of facilities whose continued availability will be a matter of active government concern under this order. To provide necessary coordination in the execution of the program, an Interagency Defense Facilities Maintenance Board is to be established under a chairman designated by DPA, with representation to include the Munitions Board, General Services Administration, National Production Authority, and Industry Evaluation Board of the Department of Commerce. The agency interested in a particular case will also be represented, and the National Security Resources Board will be asked to provide an observer.

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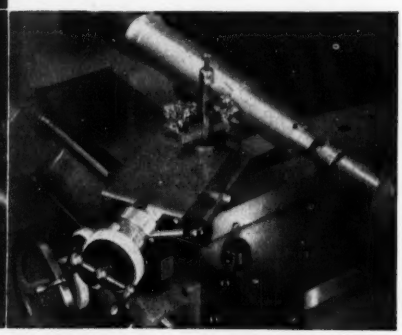
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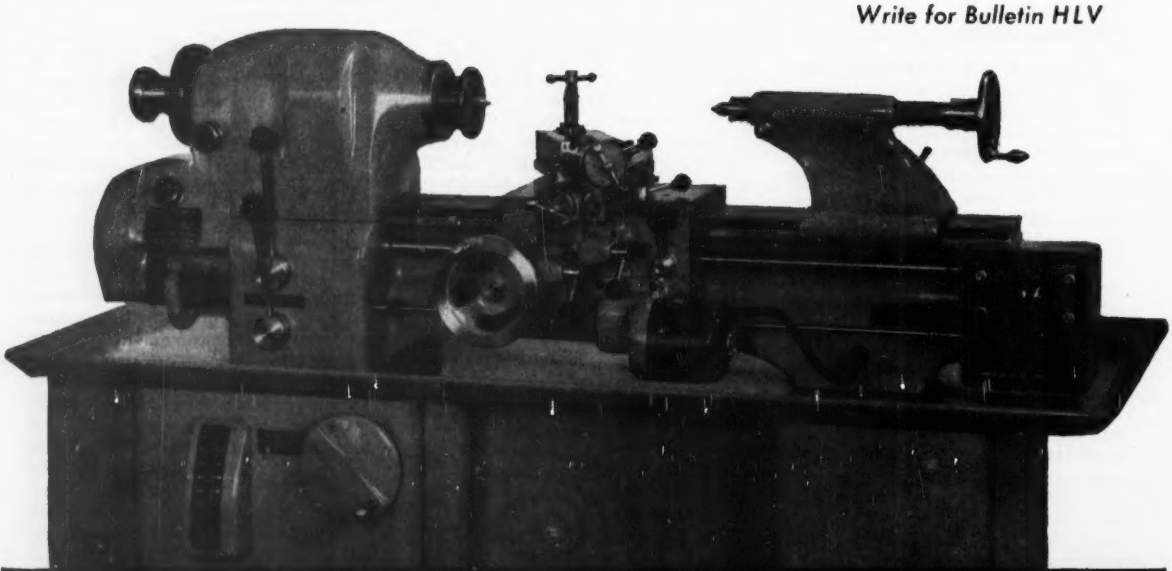


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FINE FEED

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HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Three Cartons of Cigarettes A Week!

ONE fallacy all too prevalent in labor and certain professional circles is that American workers could materially improve their standard of living by taking a larger share of the profits which now go to the owners of business enterprises. This erroneous thought springs from the teachings of Karl Marx who argued that workers would never be free until they owned the facilities of production.

The truth of the matter is that if all the dividends paid to stockholders were added to the pay envelopes of the workers, the additional income would amount to "peanuts." Benjamin F. Fairless, chairman of the board and president of the United States Steel Corporation, recently made a keenly analytical speech in which he pointed out that of the total sum of money divided between the owners and workers of his corporation in 1951, the share which went to the workers amounted to 92 per cent, while the owners received 8 per cent. If all of the stockholders' dividends had also gone to the workers, the additional money would only have been enough to buy the equivalent of three cartons of cigarettes weekly per worker.

If the company were operated on such a basis, it would soon be destroyed, because without profits there would be no additional investments. Furthermore, the history of the communistic and socialistic nations shows that the workers never do own the production facilities even though they have been seized by the government. The State owns the facilities and the "Commissars" own the workers—the workers own nothing.

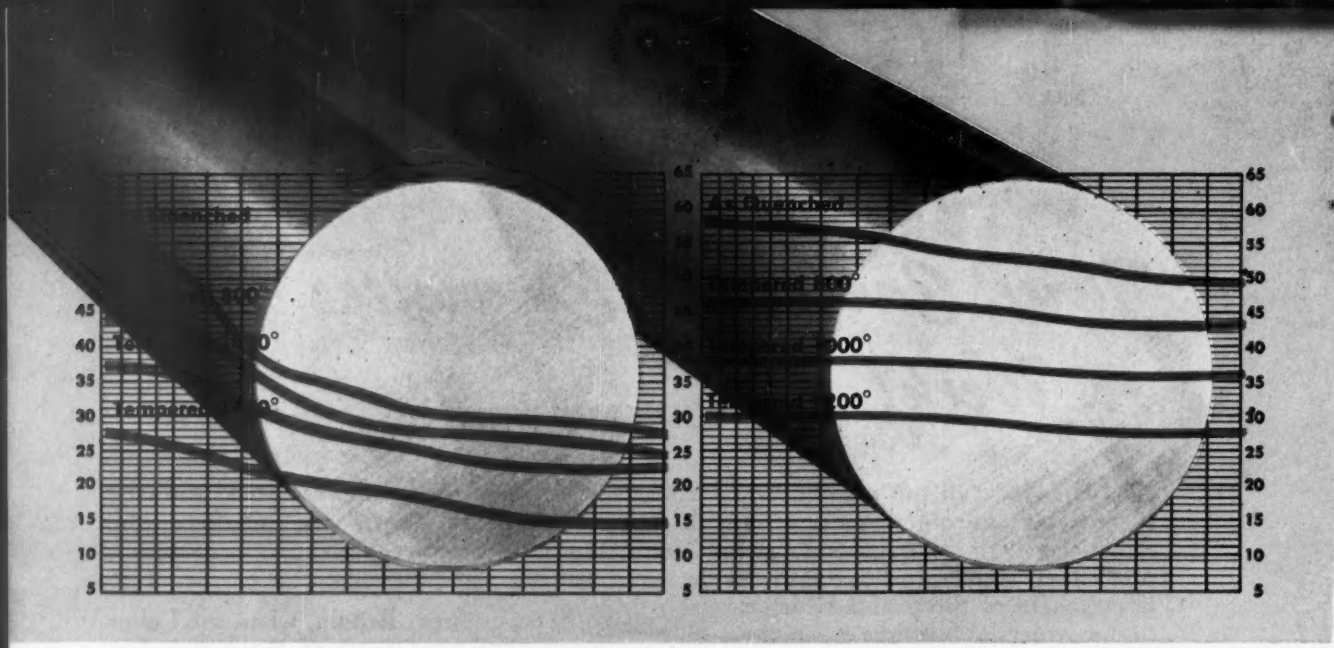
Even in Great Britain, when the Labor Party took over most of the key industries, the workers soon found that they had merely traded one set of bosses for another. Their wages remained low in comparison to the income of American workers employed under our free enterprise system. As a matter of fact, the pay of the British steel worker today is just about one-third that of the average worker in American steel mills.

Only by producing a larger economic pie can a bigger share of money be paid to both workers and stockholders. As Mr. Fairless emphasized in his address, it does not matter how many billions of dollars there are in our collective pocket as a nation, we cannot buy more than we have produced. To live better, we must make more.

Production is the result of teamwork, not of conflict. For this reason, the nation will never achieve maximum production until people understand that the interests of workers and factory owners are identical and not opposed to each other. One group cannot prosper while the other suffers. Inflammatory statements issued by either group can only be harmful to both. Industrial peace is the greatest boon to everyone.

Charles O. Herb

EDITOR



Same Alloy...but *What a Difference!*

Graphic Reason for Using Ryerson Certified Alloy Steel

Here are two bars of alloy steel recently purchased by a metalworking company. Both are the same type of alloy—AISI TS 4140 annealed. And both are high quality steels with chemistry meeting all the requirements of the specification.

But look at the difference revealed by hardenability tests!

The tempered-at-800° curves are typical. For the bar at left this curve starts at 44 Rockwell C and ends at 24. For the bar at right the same curve starts at 45—ends at 42. And the differences in hardenability naturally reflect equally marked differences in the mechanical properties that can be obtained from each bar.

Yet remember both bars are the same alloy and therefore are often expected to react in the same way. Their differences are only the normal variations that occur between different heats within the same specification.

That's why it is so important for you to specify and buy Ryerson Certified Alloys. *Every heat* of as-rolled and annealed alloy steel from Ryerson has been tested for hardenability in our own laboratory. When you receive a shipment of Ryerson alloys you also receive a Ryerson Alloy Certificate which shows exactly how *your particular heat of steel* responded to those tests. And the Certificate interprets the test results for you in terms of mechanical properties.

Thus you know the actual—not just the theoretical—hardenability of your alloy steel from Ryerson. And you know exactly how to heat treat that steel to obtain the desired properties. So why guess at hardenability? Use Certified Ryerson Alloys and be sure.

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Manufacturing 90-MM. Shells

By O. L. DUCHARME
Shell Plant Manager
Bryant Heater Division
Affiliated Gas Equipment Co.
Cleveland, Ohio

A MODERN, completely conveyorized production line utilizing the most advanced methods of manufacturing has been installed in the London Road plant, Cleveland, Ohio, of the Bryant Heater Division, Affiliated Gas Equipment Co., for making a new high-explosive 90-millimeter shell. The contour of this shell, developed especially for a new tank gun, makes it one of the most difficult shells to manufacture. Production problems, however, have been solved, and many individual operations commonly performed in most shell plants have either been combined or eliminated.

For example, seven separate operations requiring as many as twenty individual machines to attain the same production are now performed on six-spindle automatic chucking machines. Also, other operations usually performed individually have been combined on four-spindle automatic chucking machines and multiple-tooled semi-automatic lathes. Another feature of this installation is a faster, improved method of pressing bands on the shells. A conventional press equipped with a special band-pressing die can equal the production of four or more conventional tire-setting machines.



Fig. 1. Close-up view of the tooling area on a four-spindle chucking machine employed to chamfer and face both ends, and drill the closed end of 90-millimeter shell forgings

Forgings for the 90-millimeter shells are made from a high-carbon alloy steel by the upsetting method to develop maximum uniform strength. The cavity in the forging is shot-blasted with steel grit to remove scale, since the forging is chucked on this surface for the first machining operation. Out-of-roundness of the forging is held within plus or minus 0.020 inch, and its hardness is approximately 235 Brinell.

Center drilling and cutting off, or facing, both ends of shell forgings have traditionally been performed as two separate operations on individual machines. However, in producing these shells, Bryant has combined the two operations on Conomatic four-spindle, automatic chucking machines such as the one shown in Fig. 1.

The shell forgings are manually loaded on air-operated expanding mandrels, one of which is seen left of center. A spring-loaded form block on each mandrel end fits against the tapered cavity in the forging for locating purposes. At the loading station, a single-point tool held in the upper front cross-slide is advanced in order to remove flash from the open end, or nose, of the shell forging.

When the spindle-carrier on which the work-holding mandrels are mounted has been indexed, thus moving the forging to the second station, a spot drill held on the main end-slide is advanced to rough-machine the closed end. Simultaneously, three single-point tools on the lower front cross-slide are fed toward the work to rough-face and chamfer the closed end, and finish-face the open end.

At the third station, the closed end of the shell forging is finish-faced, chamfered, and spot-drilled. The open end of the forging is chamfered and center-drilled at the fourth station, with the center drill mounted on the main end-slide and rotated by means of an auxiliary spindle. When the work-piece has been returned to the first station, it is manually unloaded from the mandrel. A faced and drilled forging is shown at *A* in Fig. 2.

Triangular-shaped carbide tool bits are employed on all cross-slides of this four-spindle chucking machine. Such bits can be indexed 120 degrees in their holders when the cutting edge has become dull, and turned upside down when all three edges are worn. In this way, six sharp

Fig. 2. Progressive shapes produced in manufacturing a new high-explosive, 90-millimeter shell. A faced and drilled forging is shown at (A) and a completed shell at (L).

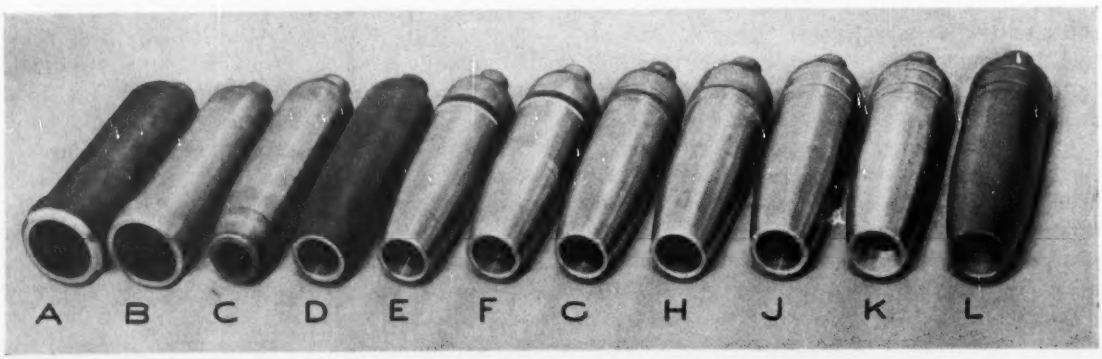




Fig. 3. Hydraulically actuated and cam-controlled tools are provided on this semi-automatic lathe to rough-turn the entire contour of the shell. More than 7 pounds of metal is removed.

cutting edges can be used on each tool bit without affecting the set-up, and before resharpening of the bits is necessary. For this operation, the forgings are rotated at 230 R.P.M. Drills on the main end-slide are fed at the rate of 0.007 inch per revolution, while tools on the cross-slides are advanced 0.010 inch per revolution. Stock removal from the open end of the forging is about 1/8 inch, while approximately 3/16 inch is faced from the closed end. The various operations are completed in a thirty-five-second machining cycle.

More than 7 pounds of metal is removed from each shell forging in rough-contour-turning its complete periphery on Morey semi-automatic, hydraulic lathes, such as the one shown in Fig. 3. In most other shell plants, this operation is done in two steps—performing rough-form-turning on one machine and semi-finish-turning on a second machine. The heavy-duty semi-automatic lathes are powered by 75-H.P. electric motors, and equipped with hydraulic expanding mandrels and hydraulically actuated tailstocks. Four triangular-shaped carbide tool bits are held on three independent, hydraulically operated and cam-controlled tool-slides at the front of each machine, while two similar tool bits on slides at the rear of the machine are hydraulically fed toward and away from the forging. Each of the four front tools contour-turns from 2 5/8 to 3 7/8 inches along the axis of the shell.

In this operation the forgings are rotated at a surface speed of 330 feet per minute, and the tools are fed at the rate of 0.030 inch per revolution. Maximum depth of cut is about 1/4 inch, and the machining cycle is completed in fifty seconds. Various diameters on the periphery of the shells are maintained within plus or minus 0.005 inch, and eccentricity between the cavity and outside diameter is held to 0.020-inch total indicator reading. A rough-contour-turned shell is shown at *B* in Fig. 2.

Open, or nose, ends of the contour-turned shells are cold-formed on the Farquhar 350-ton hydraulic press shown in Fig. 4. About 250 tons of the press capacity is necessary for this severe cold-nosing operation. A carbide die is employed



Fig. 4. A 350-ton hydraulic press equipped with a carbide die is employed to cold-form the nose on the open end of 90-millimeter shell forgings. The work is hydraulically ejected.

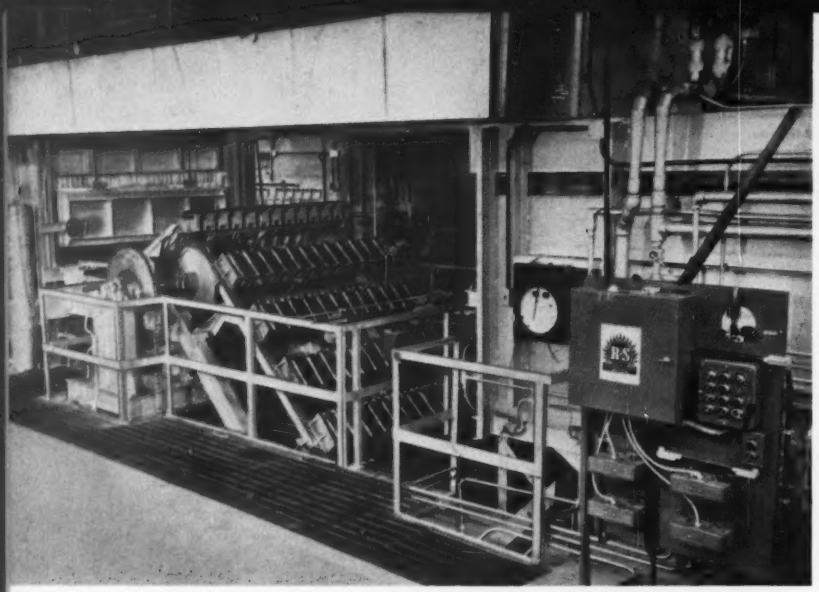


Fig. 5. At the end of the heat-treating furnace (right), the shells fall into a quenching oil tank (center), and are then transferred on a conveyor into an annealing furnace (left).



Fig. 6. Heat-treated and annealed shells are loaded into work-holders on the ten-station rotary table of this air-blasting machine, where the shell cavities are shot-blasted.

to minimize wear, and lubricant is applied to each shell prior to forming. That portion of the shell extending about 5 inches from the open end is compressed to form the nose to a radius of 32 inches. The press ram travels at the rate of 17 feet per minute during forming, and the nosed shell is hydraulically ejected from the die as the ram rises. The shell seen at *C* in Fig. 2 has been cold-nosed in this set-up. Heat-treatment of the 90-millimeter shells is done in an R-S Products gas-fired, continuous type furnace. An interesting feature of the furnace is that it can quickly be converted to oil heating in case of a shortage of gas. The shells are placed in tubes, twelve abreast, and are pushed through the furnace by dogs projecting upward from an endless chain. About 300 shells are in the furnace at one time.

The furnace is maintained at a temperature of 1575 degrees F., and the shells pass through the furnace in one hour. At the end of the furnace, the shells fall down chutes into a 14,000-gallon, quenching oil tank, and are then conveyed out of the tank and into a draw furnace, as shown in Fig. 5. In this second furnace, the shells are held at a temperature of 1175 degrees F. for one and one-half hours. Then they automatically pass through a forced-air, vertical cooling tower. After heat-treating and annealing, the shells have a Brinell hardness of about 262 and a minimum tensile strength of 85,000 pounds per square inch.

Cavities in the heat-treated and annealed shells are blasted with steel shot to remove scale and smooth the surfaces for subsequent locating and chucking purposes. The Pangborn air-blasting machine, Fig. 6, is equipped with a ten-station rotary table. The shells are held in a vertical position and rotated as they are inter-



Fig. 7. Special multiple-head milling machine designed to produce five staking notches in nose end of a 90-millimeter shell. Parts are automatically loaded from a magazine.

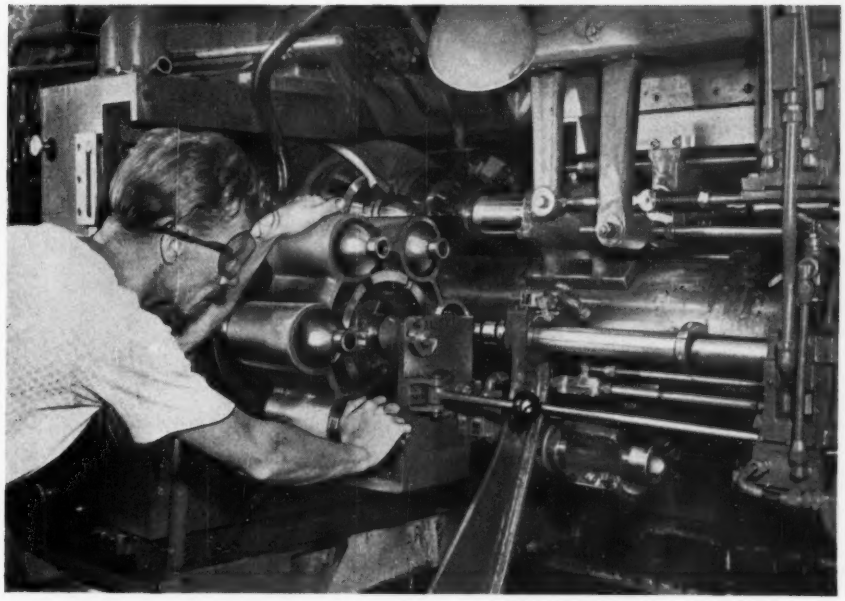


Fig. 8. Drilling, counterboring, reaming, and tapping the closed ends of shells, as well as forming, undercutting, and knurling the band seats, are completed on chucking machines.

nally blasted. Each shell is blasted four times as it passes through the cabinet, and each blast lasts twelve seconds. A heat-treated and shot-blasted shell is seen at *D* in Fig. 2.

The noses of the shells are bored, faced, and chamfered on modified Morey turret lathes. The turret has been removed from these standard machines, and a special cross-slide and tailstock installed. A tolerance of plus or minus 0.004 inch is maintained on the 1 1/2-inch long bore. The periphery of the shell is finish-contour-turned on Morey semi-automatic, hydraulic lathes similar to those employed for rough-contouring except that only four carbide tool bits are used on each machine. One of three tools mounted on slides at the front of each machine is round instead of triangular, and can be rotated slightly and then turned upside down as it becomes dull. This hydraulically operated, cam-controlled round bit forms the long sweeping contour near the nose of the shell. For this finishing operation, the work is rotated at 402 R.P.M., and the tools are fed 0.012 inch per revolution. Machining is completed in a one-minute cycle. The shell seen at *E* in Fig. 2 has been finish-turned.

Both front and rear bourrelet surfaces on the periphery of the shell are finish-turned on another group of modified Morey turret lathes. The two surfaces, each approximately 1 1/4 inch long and 4 inches apart, are turned within plus or minus 0.0025 inch of the required diameter. A surface finish of 250 micro-inches r.m.s. is specified for this operation.

Five staking notches, approximately 72 degrees apart, 0.080 inch deep, and 0.150 inch wide, are milled in the nose of each shell on the LeMaire shell notching machine shown in Fig. 7. The five angularly mounted heads on this special



Fig. 9. Set-up employed on a standard press for assembling sintered iron rotating bands to the periphery of shells. Two bands are applied to each shell in one operation.

machine are equipped with slitting saws 3 1/2 inches in diameter. Shells to be notched are placed in the magazine, seen at the right, and are automatically lifted into machining position and clamped. Then the cutter-head is advanced to mill the notches. After the machine head has been retracted, the notched shell is automatically lowered into an unloading chute at the left.

A major improvement in shell manufacturing methods at Bryant has been the use of Conomatic six-spindle, automatic chucking machines for drilling, counterboring, reaming, and tapping the closed end; and forming, under-cutting, and knurling band seats on the periphery of the shell. In other shell plants, as many as twenty individual machines are used to attain the same production as that secured from four six-spindle automatic chucking machines.

Production on these machines has been increased by the use of a six-station, rotary drum feeding arrangement, such as the one seen in the heading illustration and Fig. 8. Shells to be machined are manually loaded into holes in the work-carrying drum as shown, and the drum is indexed with the spindle-carrier of the machine. As each shell on the drum is indexed into a position opposite one of the draw type collets on the spindle-carrier, it is pushed out of the drum and into the collet by means of an air-operated feeding plunger. A special stop and work ejector is installed in each of the six work-spindles.

When the loaded shell has been indexed to the first working station, its closed end is drilled to a depth of 7/8 inch by means of a 15/16-inch diameter drill held on the main end-slide. At the second station, the drilled hole is counterbored to a diameter of 1.14 inches and a depth of 1/4 inch; and the two band seats, 3/4 inch apart on the periphery of the shell, are rough-formed with tools mounted on the rear lower cross-slide. These band seats, or grooves, are finished to a width of 0.532 inch and a depth of 0.14 inch, and the tracer cavity is finish-counterbored at the third station.

Tools mounted on the fourth station cross-slide are employed to knurl eighty scores around each band seat. The scores project approximately 0.035 inch from the bottoms of the band seats, form an included angle of 70 degrees, and are spaced about eight to an inch of circumference. The drilled hole in the closed end of the shell is finished, in preparation for threading, by a reamer mounted on the main end-slide at this same station.

At the fifth station, the drilled and reamed tracer cavity in the closed end of the shell is internally threaded with a left-hand 1–20 thread tap. The tapping attachment used for this operation has two pairs of gears running at different speeds—one for feeding the tap into the work and the other for withdrawing the tap. A double friction clutch, shifted by adjustable cams, changes the direction of drive, and a sensitive tripping mechanism insures accurate depth control. Dovetails, forming an angle of 15 degrees with the side walls of the band seats, are undercut by means of cross-slide tools at this fifth station.

When the shell is indexed to the sixth station, it is automatically ejected from the collet. The shells are rotated at 210 R.P.M., while the cross-slide tools are fed at the rate of 0.007 inch per revolution and the main end-slide tools, 0.006 inch per revolution. The machining cycle requires only thirty seconds per shell. Shells coming from the six-spindle chucking machines have the appearance of the one shown at *G* in Fig. 2.

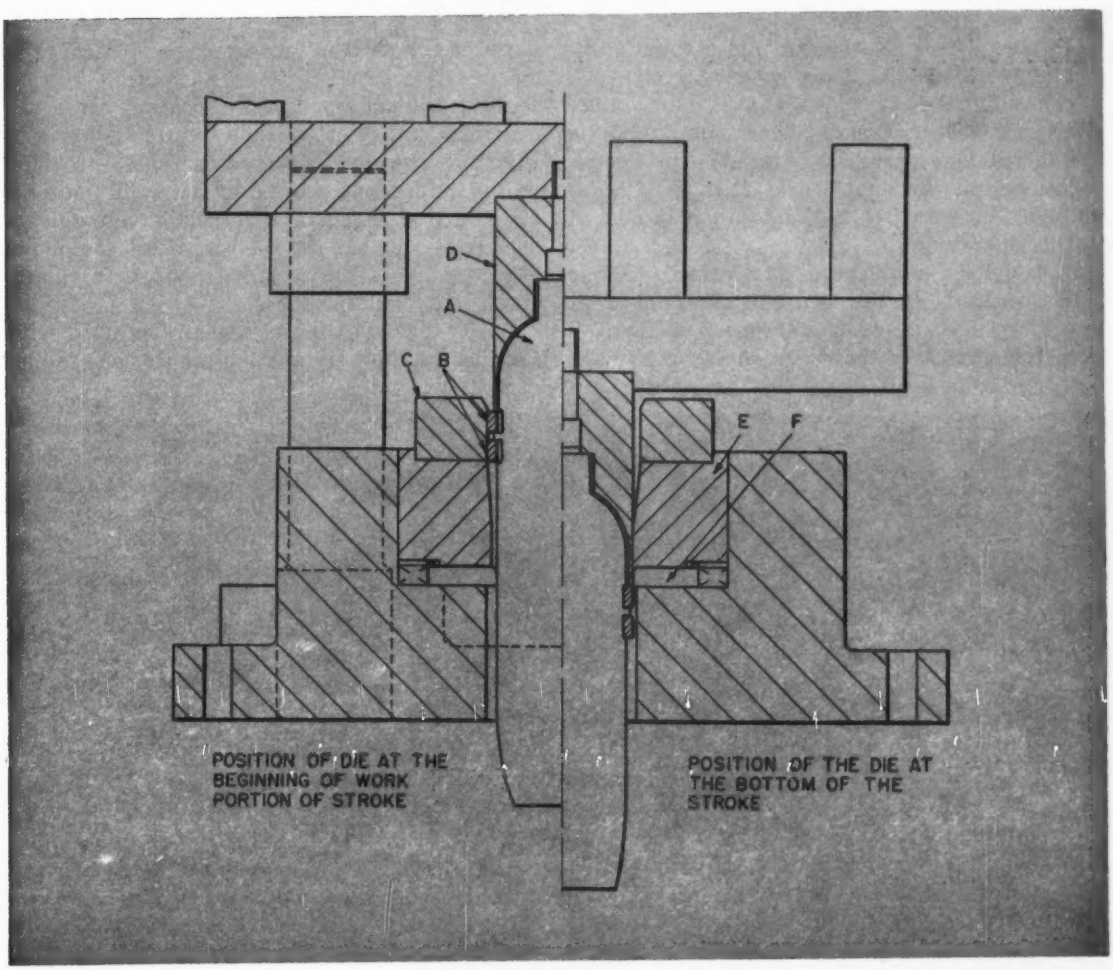
Sintered iron rotating bands are pressed into the band seats on the 90-millimeter shells by means of the simple set-up seen in Fig. 9. This

method, accomplished with a special die on a standard Bliss 150-ton press, is at least four times as fast as that using conventional tire-setting machines.

The application of rotating bands to the shell is an extremely critical operation, and considerable experimentation was necessary before a suitable die was developed. The sintered iron bands must fill at least 60 per cent of the dovetailed space in the band seats. This is controlled by sawing apart every 2000th shell so that it can be visually inspected. If too much pressure is exerted in squeezing the bands into the seats, the density of the porous, spongy iron from which the bands are made would be increased. Too dense a structure might cause the bands to crack, or cause wear on the gun barrel in firing. Also, the sintered iron bands are impregnated with a corrosion-preventive wax that might become dissipated under high pressure or temperatures exceeding 195 degrees F. Only about 27 tons of the press capacity is employed for this operation.

A cross-sectional drawing of the die employed for band pressing is shown in Fig. 10. Shell *A* is placed on the die with one sintered iron band *B* slid onto the shell from each end. Location of the rings is maintained by plate *C*. When the press ram is lowered, punch *D* contacts the upper surface of the shell and the top ring, as seen at left. As the ram continues downward, the bands are pressed into the seats on the shell by the tapered bore of die *E*. (Final sizing of the band diameters was obtained in the original die with a spring-loaded ring *F*. However, this ring has been found unnecessary, and has been omitted in subsequent dies.) When the banded shell has been pushed through the bottom of the die, right, the ram rises and the cycle can be repeated. Downward travel of the ram is con-

Fig. 10. Cross-section of the die employed on the press illustrated in Fig. 9 for pressing bands (B) onto shell (A). Tapered die (E) compresses the bands into the seats.



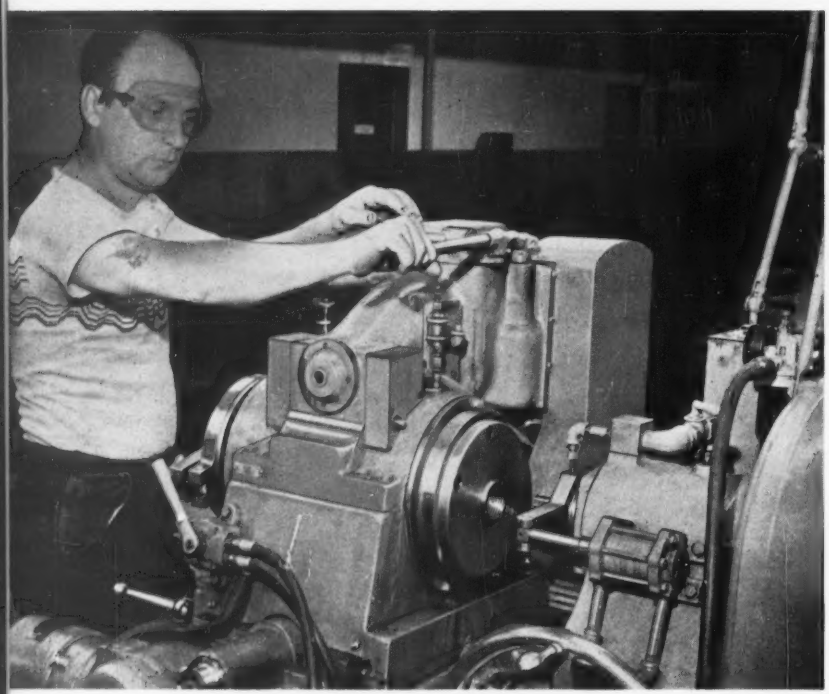


Fig. 11. A 2–12 internal thread is produced in the nose end of the 90-millimeter shells on the semi-automatic thread-milling machine here illustrated.

trolled at 12 feet per minute, and a rapid traverse is provided for raising the ram.

The nose end of the shells is next internally threaded on Lees-Bradner semi-automatic thread-milling machines, Fig. 11, producing parts such as the one seen at *K* in Fig. 2. A uniform, high-quality 2–12 thread is produced in this operation.

Although a rigid inspection is performed after each operation, at this point in the production line every shell is given a 100 per cent inspection. Smoothness of the surface finish on various parts of the shell is measured electronically by means of a Profilometer. A multiple gaging set-up in which seven dial-indicating gages are employed on a special bench fixture is shown in Fig. 12. The shell is placed on rollers provided on the fixture, and rotated by hand. By observing the dial gages, the inspector can quickly determine whether the shell is within the allowable tolerances on eccentricity, length, diameters, and wall thickness.

Shells that pass inspection are stamped with 1/8-inch high letters and figures to show the lot



Fig. 12. Gaging set-up equipped with seven dial-indicating gages for inspecting the length, diameter, wall thickness, and eccentricity of shells

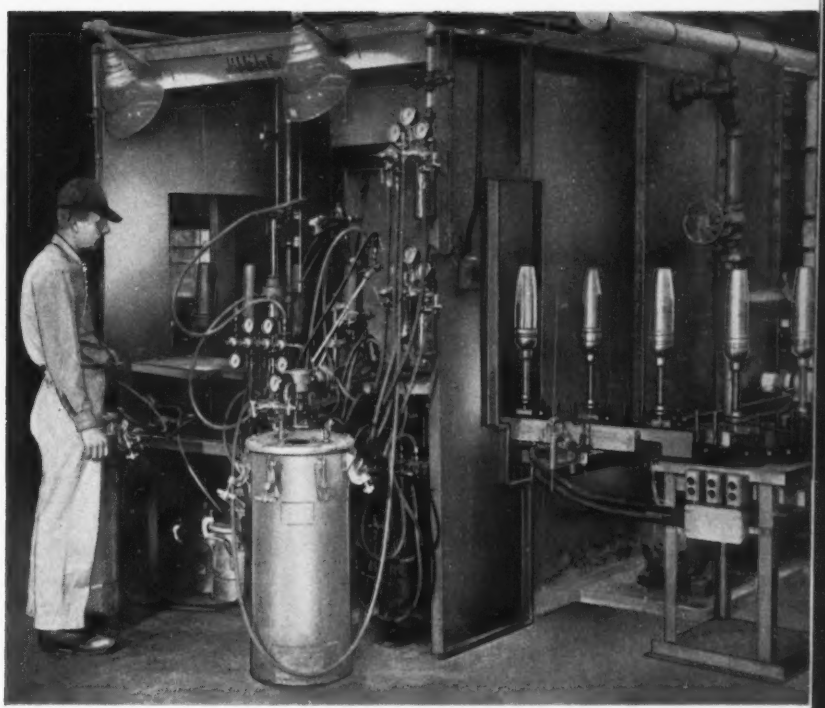


Fig. 13. Inside surfaces of the shells are sprayed with an acid-proof black paint, and the exterior with olive drab enamel, in this automatic installation.

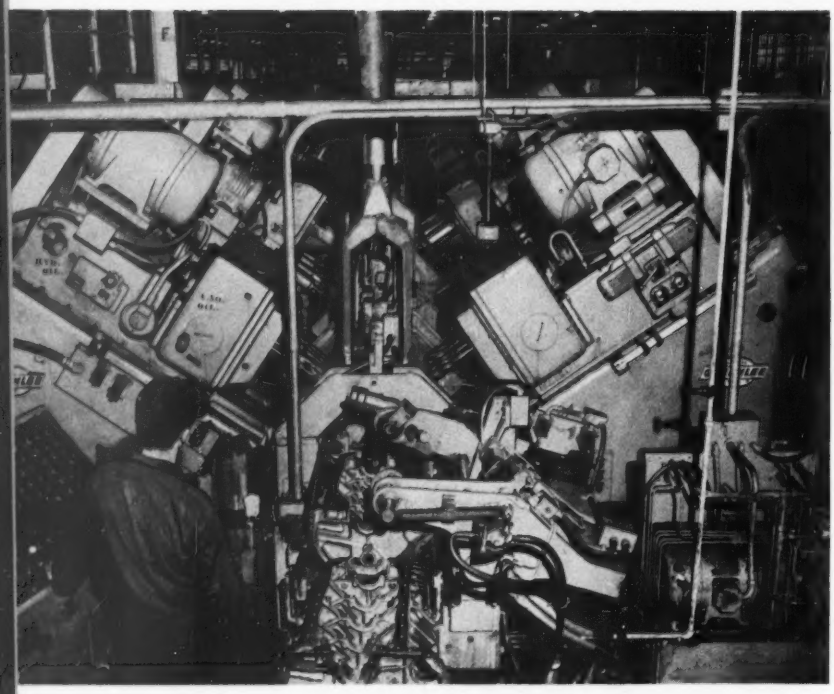
number, year of manufacture, caliber, and designation of the shell. The shells are then placed on the conveyor of a Ransohoff five-stage cleaning and phosphatizing machine, in which they are successively sprayed with an alkali cleaning solution maintained at a temperature of 170 degrees F.; hot water (130 degrees F.); phosphoric acid (120 degrees F.); cold water; and a chromic acid solution kept at 170 degrees F. The shells are held on the conveyor at an angle, with open end down, to facilitate draining. At the exit end of the cleaning and phosphatizing machine, the shells pass through a gas-heated air-drying oven.

While the shells are still warm, they are placed vertically on studs held in a continuous chain conveyor, as seen at the right in Fig. 13. They are carried through a Binks automatic paint-spraying booth, where the entire interior surface of each shell (with the exception of the threads) is coated with an acid-proof black paint, and the entire exterior surface with olive drab enamel. Paint thickness is maintained between 0.001 and 0.0015 inch.

As each shell enters the paint booth, it is rotated by a rubber-belt friction drive which contacts a sheave at the lower end of each shell-carrying stud. Three spray guns cover the exterior of the shell, while one more gun—raised and lowered by an air cylinder—covers the interior. The conveyor is long enough so that the freshly painted shells can dry in the air for approximately ten minutes before they are unloaded. Referring to Fig. 2, a painted shell is shown at *L*.

In the painting set-up on most shell lines, the work is screwed onto the carriers. At Bryant, however, it was found that the shells could simply be placed on a close-fitting brass plug secured to the tops of the vertical studs. In this way, loading and unloading are simplified, and a higher production is possible.

How Buick Builds



An ultra-modern plant, equipped with the latest types of automatic transfer machines, contouring lathes, and profile-milling and flame-hardening machines, is capable of producing 150 V-8 engines per hour

By STANLEY J. WHITE
Superintendent, Engine Plant
Buick Motor Division
General Motors Corporation
Flint, Mich.

Fig. 1. This 74-foot long automatic transfer machine is equipped with seventy-nine tools at eighteen stations to complete 110 operations on each cylinder block.

COMPACTNESS, light weight, and rigidity are outstanding features of the new V-8 engine which powers the Super and Roadmaster lines of 1953 Buick automobiles. Also, wear has been minimized by designing the engine for piston strokes of only 3.2 inches and with relatively large bores, 4 inches in diameter.

These advanced design engines are produced in an ultra-modern plant equipped with the latest type production equipment. The engine factory, containing 780,000 square feet of floor area, has complete chip disposal and coolant clarifying systems. Chips from every machine are carried to railroad freight cars by conveyors installed below the factory floor. Coolant is pumped from the conveyor trenches and grinding machines to a Hoffman clarifier. Clean, filtered coolant is then recirculated to the individual machines.

Cast-iron cylinder blocks for the V-8 engine are only about 24 inches long and weigh 180 pounds—compared to the 37 1/2-inch length and 267-pound weight of the in-line eight-cylinder engine blocks. The blocks contain a cast-in steel tube which serves as the main oil gallery for supplying oil to the five main bearings and five camshaft bearings.

Exterior surfaces on the cylinder blocks are machined to a flat, smooth finish by means of two Cincinnati horizontal broaching machines. The rams of these machines are actuated mechanically by a rack-and-pinion planer type drive that is powered by a variable-voltage motor and generator set. This type drive permits the ram speed to be varied between 100 and 200 feet per minute. Operating with a ram speed of 150 feet per minute, each machine is capable of broaching 123 cylinder blocks per forty-eight-minute working hour. The broaching machines are equipped with inserted type carbide cutters which result in easier replacement and adjustment, reduced maintenance, and longer tool life than was the case with conventional, solid type broaching cutters.

In the first operation, performed on the smaller, one-way horizontal broaching machine,

V-8 Engines

the valve chamber cover (top) surface and four locating lugs on one side of the cylinder block are rough- and finish-broached. The cast block is arranged with its pan rail side down and front end leading in a hydraulically operated work-holding and roll-over fixture. A 25-H.P. variable-voltage drive motor and a generator set with a 75-H.P. motor are provided on this broaching machine.

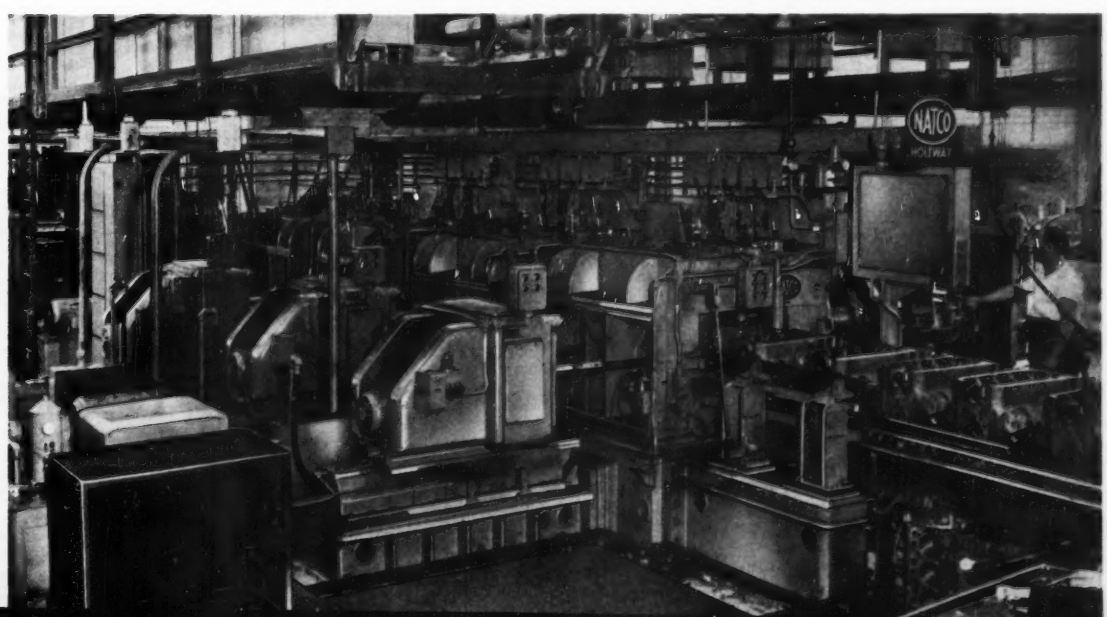
In the second operation, performed on the two-way horizontal broaching machine, the pan rail (bottom), bearing lock surfaces, cap seats and widths, half round crankshaft bearing surfaces, and both banks are rough- and semi-finish-broached or finish-broached. Several of these surfaces are completed as the machine ram moves in one direction, and the remaining surfaces (both banks) are broached as the ram returns. Located between a left- and right-hand, hydraulically clamped work-holding fixture is a mechanism for rotating the cylinder block through an angle of 180 degrees and elevating it into position for the return stroke of the ram. Completely broached castings are automatically unloaded on a gravity roller conveyor leading to the next machine.

This huge two-way horizontal broaching machine is powered by a 100-H.P. variable-voltage drive motor and a generator set with a 300-H.P. motor. From 3/16 to 3/8 inch of stock is removed from various surfaces of the cast block by 1-inch square, carbide-tipped rough-broaching bits and solid carbide blades. The broach-holders need not be removed, and only those individual tools that become worn or chipped have to be replaced.

Broached blocks pass through an Ingersoll nineteen-station process machine (or similar combination machines made by Sundstrand and Moline) in which the eight cylinders are rough-bored, and various surfaces on the castings are drilled, reamed, chamfered, spot-faced, and milled. A total of 115 cutting tools are employed on a W. F. & John Barnes twenty-seven-station transfer machine to drill, chamfer, ream, tap, bore, or counterbore all holes in the ends of the cylinder blocks. These holes vary in diameter up to 2 1/4 inches (for the starter hole).

At the seventeenth station on this machine, oil gallery holes in the cast block are automatically blown free of chips and inspected for size. A hydraulically actuated bushing is provided at the twentieth station for supporting the bar used to machine the center camshaft bearing surface. Production on this machine—about seventy-five blocks per hour—is based on a cutting speed of 75 surface feet per minute (510 R.P.M. for a 9/16-inch diameter drill), with a feed per revolution of 0.0116 inch (5.92 inches per minute). Automatic transfer of the blocks to each succeeding station and clamping of the work requires less than eight and one-half seconds.

Fig. 2. Front, center, and rear camshaft bearing seats in the cylinder blocks are accurately bored on this fifteen-station automatic processing machine.



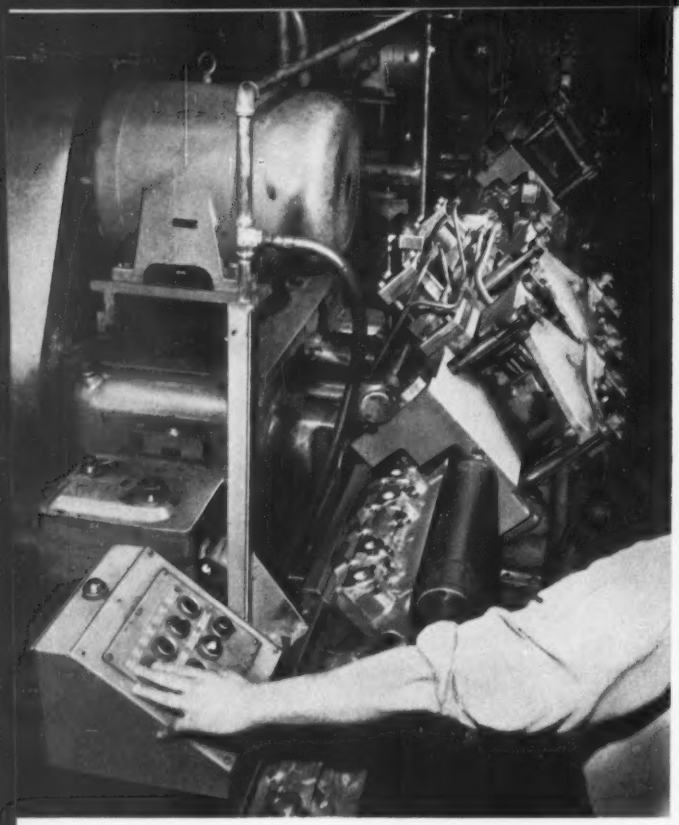


Fig. 3. A special tracer type milling machine is used to profile-machine the combustion chambers in the cylinder heads.

Holes in the top and bottom surfaces, as well as in various pads on the cylinder blocks, are drilled, chamfered, reamed, and counterbored on a Footburt eighteen-station transfer machine. Also, at the eighth station on this machine, five bearing lock slots are milled in each block. This machine is equipped with 143 hydraulically fed spindles and work roll-over fixtures located at the first and twelfth stations. A production of about seventy-five blocks per hour is possible on this machine, with a feed rate of 4 1/2 inches per minute.

The cylinder blocks then pass through the Greenlee eighteen-station automatic transfer machine shown in Fig. 1. This machine completes 110 operations on each of 75 blocks per hour, using 79 tools to drill 67 holes, ream 16 holes, bore 2 holes, countersink 9 holes, and core-drill 16 holes. Cast blocks arrive at this machine pan rail up, and at the first station are automatically rotated through an angle of 180 degrees so that the pan rail faces downward. At the seventh station, the blocks are rotated 360 degrees to remove accumulated chips. Left-hand heads at Stations 11, 12, 14, and 15 are horizontal, cross-fed units designed to drill and bore starter mounting-pad holes parallel to the direction in which the blocks are transferred through the machine. Production is based on a cutting speed of 65 surface feet per minute (994 R.P.M. for a 1/4-inch diameter drill), with a feed of 0.0045 inch per revolution (4 1/2 inches per minute). Tools are rapidly traversed toward and away from the work-pieces at the rate of 190 inches per minute, and the blocks are unclamped, transferred to the succeeding station, and again clamped in an eight-second cycle.

On another Greenlee automatic transfer machine, this one with nineteen stations, 179 more operations are completed on the top, bottom, and both banks and ends of each block, also at the rate of 75 per hour. A total of 175 tools are provided to drill 37 holes, tap 91 holes, ream 36 holes, countersink 32 holes, and simultaneously drill and countersink 4 holes. Chips are dumped from the blocks with a 360-degree roll-over fixture at the tenth station. At Station 16, a 90-

Fig. 4. Valve stem guide holes in the cylinder heads for the V-8 engine are machined, and bushings are pressed into the holes. The bushings are subsequently machined in this set-up.



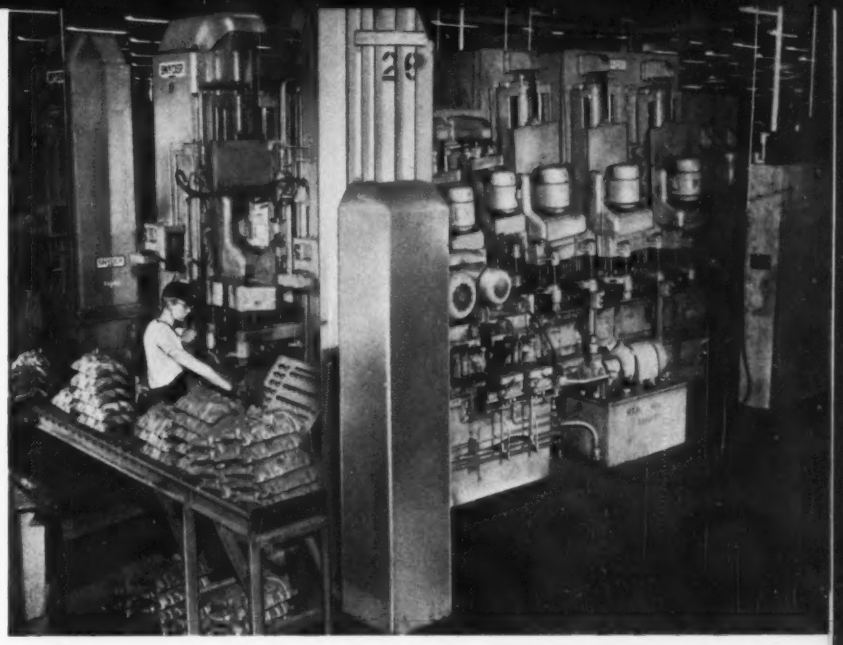


Fig. 5. Dual type intake manifolds are drilled, spot-faced, milled, chamfered, countersunk, and then tapped on this sixteen-station automatic transfer machine.

degree roll-over fixture turns the pan rail surface on the block to the side for tapping the top and bottom surfaces with horizontal heads. At Station 19, each block is again rotated 90 degrees so that its pan rail faces upward for the next machining operation.

An extremely difficult, precision operation is that of boring the camshaft bearing seats on the Natco fifteen-station automatic processing machine shown in Fig. 2. These camshaft bearing seats are well concealed in the cylinder block casting, and it required ingenious tooling to provide accurate location and ample support for the boring-bars in order to maintain the required alignment of plus or minus 0.0005 inch with relation to the crankshaft bearing seats. This was accomplished by locating the cylinder blocks from above with dowel-pins and rest-buttons, from the sides with shot pins, and from below with hydraulically actuated, floating bushing plates that guide the boring-bars. The machine spindles are specially designed to expand the tools by means of hydraulically operated thrust bars.

This Natco machine consists of a way type straight-line indexing fixture, one double station for loading, four double stations for machining, three single idle stations, and one double station for unloading. The cylinder blocks are loaded two at a time (one in each loading station), hydraulically advanced two stations with each cycle of the machine, and hydraulically clamped at each station. In addition to rough-boring the front center, center, and rear center camshaft bearing seats, this machine grooves the block for oil slingers, and finish-faces and chamfers the rear main bearing. Tungsten-carbide-tipped cutting tools are employed for all operations. A similar Natco machine having nine stations is then employed to semi-finish-bore the camshaft and crankshaft bearing seats in the cylinder blocks. Both machines complete about seventy-five blocks per hour.

All of the automatic transfer machines have been designed to stress ease of maintenance. They conform to J.I.C. standards, and have their motors, pumps, controls, and wires easily accessible. Automatic lubrication and chip removal facilities have been incorporated, and the latest safety features are provided.

The cylinder blocks are completed by pressing in the camshaft bushings, finish-broaching both banks, planetary milling the upper flywheel housing (which is cast as an integral part of the block), and rough- and finish-honing the cylinder bores.

Cylinder heads for the V-8 engine contain profile-machined combustion chambers which insure a greater degree of accuracy and uniformity in compression ratios. Spark plugs are centrally located in the heads, and the valves are in line on one side of the combustion chambers, located at an angle of 45 degrees with the center line of the cylinder.

Both manifold faces, the combustion chamber face, and locating pads on the cast-iron cylinder heads are all machined on a Cincinnati two-way horizontal broaching machine, similar to but smaller than the machine employed for broaching the cylinder blocks. Then, holes for the push-rods, spark plugs, and various bolt and dowel holes in the heads are drilled, chamfered, reamed, and counterbored, and water outlet pads on the head are milled, on either a W. F. & John Barnes or a Footburt fifteen-station automatic transfer machine.

Profile-machining of the combustion chambers in the cylinder heads is accomplished four at a time on a special Cincinnati tracer type milling machine, Fig. 3, built by the Federal Engineering Co. Cast heads are carried through the automatic transfer cycle by a hydraulically actuated transfer bar. Two alternate combustion chambers in each of two heads are form-milled simultaneously. When a completed head is automatically unloaded, the two succeeding heads are indexed—one from the first to the second ma-

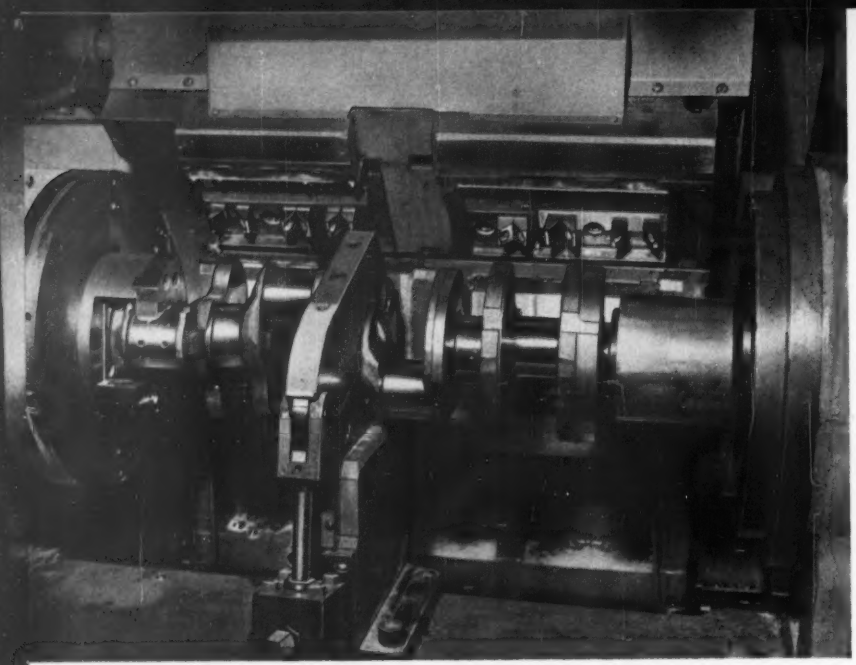


Fig. 6. Six integrally forged counterweights on the crankshaft are turned to a camlike contour and chamfered in a machining cycle of two and one-quarter minutes.

chining station and the other from the loading to the first machining station—and hydraulically clamped. It is necessary to mill alternate chambers at each station because of their close spacing.

Each of the two machining stations is equipped with four inserted, carbide-tipped blade, end milling cutters, two for roughing and two for finishing. The rotating cutters are template-controlled through contour paths to rough- and finish-mill the combustion chambers. About 1/8 inch of stock is removed from each chamber in rough-form-milling, and another 0.015 inch in finishing.

Another series of unusually difficult, close-tolerance operations performed on an automatic transfer machine is finishing the valve stem guide holes in the cylinder heads, pressing guide bushings into these holes, and then machining the bushings. Eccentricity of the bushing bores must not exceed plus or minus 0.0005 inch. These operations are performed on the W. F. & John Barnes seventeen-station automatic processing machine shown in Fig. 4, which includes, as an integral part of the transfer line, a special multiple-ram assembly press made by the Colonial Broach Co.

After being loaded at the first station, the cast-iron cylinder heads are automatically indexed to the second station and clamped. Here, two of the intake and two of the exhaust valve stem guide holes in each head are semi-finish-bored, and two 20-degree angle valve seats are machined. Similar operations are performed on the remaining four holes and two seats at the third station. Station 4 is idle, and the heads are rotated through an angle of 90 degrees by means of a roll-over fixture at the fifth station. All eight guide holes are reamed to finish size at the sixth station, using special tungsten-carbide-tipped sizing reamers in floating holders. Station 7 is also idle, and the cylinder heads are again rotated 90 degrees at the eighth station.

Rotary brushes automatically move upward from below the cylinder head at the ninth station to clean out the valve stem guide holes in the casting. The eight valve stem guide bushings are pressed into these holes by means of the Colonial multiple-ram assembly press located at Station 10. A shuttle mechanism feeds the bushings from a tube-loaded hopper into positions opposite the holes, in alignment with the hydraulically actuated assembling plungers of the Colonial

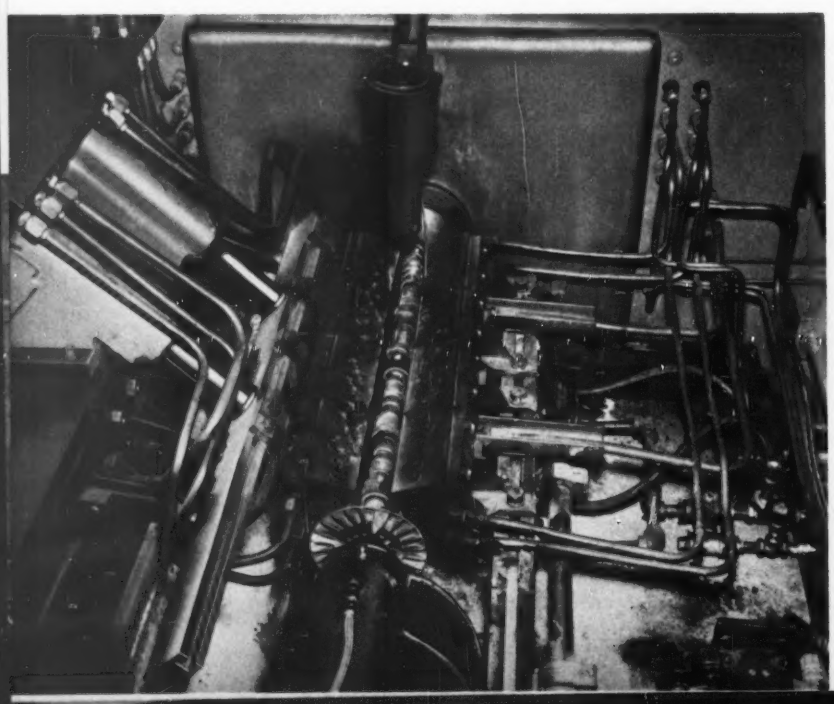


Fig. 7. Eight flame heads containing 200 oxy-propane gas ports are employed to harden sixteen cam lobes and five main bearing seats on the camshaft.

press. After the plungers have pressed the bushings into place and been retracted, the cylinder head is indexed to the idle eleventh station. Automatic inspection is provided on the assembly press, with switches interrupting the cycle if any press fit is either too tight or too loose. Signal lights indicate the location of an unacceptable fit, permitting immediate correction.

Four of the valve guide bushings (two intake and two exhaust) in each cylinder head are finish-bored at the twelfth station, and the remaining four are finish-bored at the next station. After another idle station, the heads are again rotated 90 degrees to bring the bushings into a vertical position. At the sixteenth station, the bushings are reamed with tungsten-carbide-tipped reamers in floating holders, maintaining size and eccentricity within plus or minus 0.0005 inch. The cylinder heads are unloaded at the seventeenth and final station.

Intake manifolds for this V-8 engine are of the dual type in which each manifold section supplies the fuel mixture to four cylinders. The manifolds have two horizontal, T-shaped dividing junctions, one at each end of the main branch, to provide more uniform fuel division and distribution. Practically all the machining required on the intake manifolds is completed on the Snyder sixteen-station automatic transfer machine shown in Fig. 5. The manifolds are drilled, spot-faced, milled, chamfered, countersunk, and tapped by means of left- and right-hand, vertical, and angular heads equipped with a total of fifty cutting tools. Hydraulic clamping and transfer means are provided.

At the fourth and fifth stations of this transfer machine, two carbide-tipped, inserted blade cutters, 5 and 6 inches in diameter, are provided to rough- and finish-mill the carburetor mounting pad and two small bosses on each manifold. A seven-spindle tapping head is provided at the fifteenth station to tap six 5/16–18 threaded holes and one 1/8-inch diameter Dry Seal pipe thread.

The six integrally forged counterweights on each crankshaft are all turned simultaneously to a camlike contour on a machine made by the Crankshaft Machine Co. On this double-end drive machine, Fig. 6, the crankshaft is supported on the center main bearing by a carbide-lined steadyrest. The shaft is rotated at 73 R.P.M., and the eighteen tools (six turning and twelve chamfering) are cam-controlled and fed at the rate of 0.015 inch per revolution. From 1/4 to 3/8 inch of stock is removed from each counterweight in a machining cycle of two and one-quarter minutes. Size and contour are maintained within plus or minus 0.005 inch, and no further machining of the counterweights is necessary.

Required surfaces of the forged steel camshafts for the V-8 engine are selectively hardened rapidly and economically by means of the Cincinnati Flamatic machine shown in Fig. 7. Previously, with camshafts for the in-line eight-cylinder engine, it was necessary to machine all surfaces of the shaft, copper-plate the part, turn the copper from those surfaces that were to be hardened, carburize, harden, draw, and then finish-grind. This was a very costly procedure, with the copper-plating alone costing more than 6 cents per shaft. Now copper-plating is no longer required, faster production is possible at lower cost, more exacting metallurgical specifications and close dimensional tolerances can be met, and results are consistently duplicated.

The 23 1/2-inch long camshafts are forged from S A E 1016 hot-rolled steel. After rough-machining, the shafts are carburized all over to obtain the required 0.45 per cent carbon to a minimum case depth of 0.085 inch. Since the pilot surface on one end and the periphery of the gear blank in the center of the shaft must be kept soft, about 1/8 inch of stock is turned from these surfaces, thus removing the added carbon and preventing them from hardening.

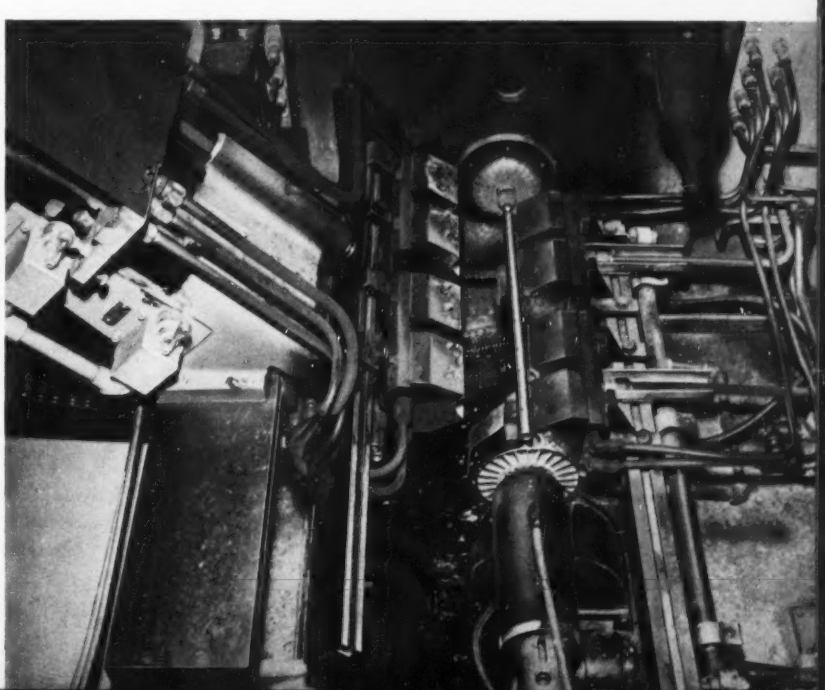


Fig. 8. Left-hand flame heads on this hardening machine have been hydraulically retracted, and the heated rocker-arm shaft will be dropped into water tank.

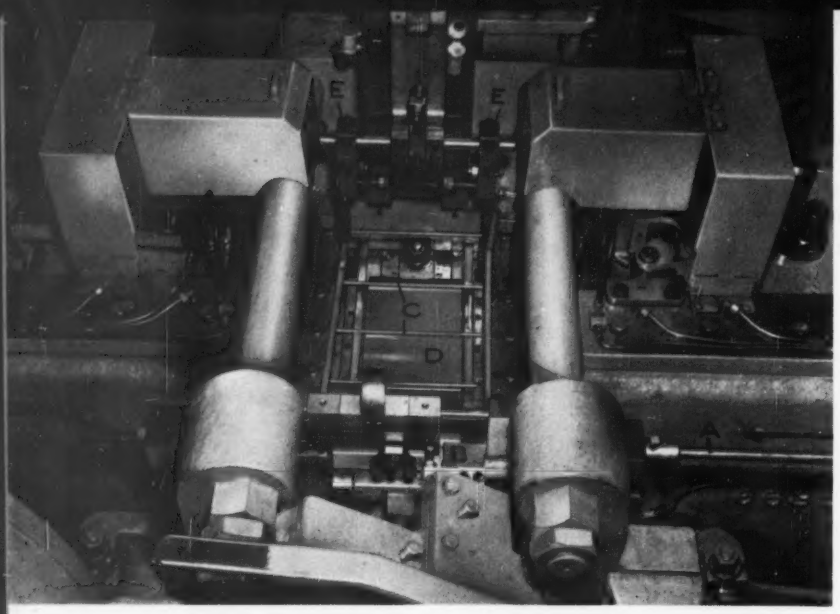


Fig. 9. Both ends of the valve push-rod are cold-headed simultaneously on this double-end machine. The rods are cut from 9/32-inch diameter coiled wire.

Then the camshafts are loaded in a magazine on the Flamatic hardening machine. Each shaft rolls onto supporting arms which automatically lift it into position between hydraulically operated centers. When clamped between centers, the shaft is rotated at 60 R.P.M. Eight flame heads (four per side), containing a total of 200 oxy-propane gas ports, are then hydraulically advanced up to the rotating shaft, and the gases issuing from the ports are ignited. The flames impinge on the sixteen cam lobes and five main bearing seats on the camshaft, heating them to a pre-set temperature. A sensitive thermopile, seen directly above the far end of the camshaft, receives radiant energy from the work. Since the amount of radiation is proportional to the surface temperature, the voltage generated in the thermopile is transmitted to a temperature recording and controlling instrument.

When the cam and bearing surfaces of the shaft reach the required temperature (after about thirty-one seconds), the flames are automatically extinguished, the heads and centers are retracted, and the shaft is lowered by the supporting arms into a water quench tank. A conveyor carries the hardened camshafts out of the quench tank. Minimum hardness of the cam and bearing surfaces is 60 Rockwell C, and the hardness patterns below these surfaces are accurately controlled and consistently reproduced. After hardening, the camshafts are drawn at a temperature of 400 degrees F., cooled in air, and finish-ground.

A similar application on another Flamatic machine, Fig. 8, is employed to selectively harden rocker-arm shafts. The shafts are carburized before machining, drilled, and then hardened. In flame-hardening, the parts are again magazine-loaded, clamped between centers, rotated during heating, and dropped in a water quench tank. The staggered flame heads heat only the eight rocker-arm seats on each tubular shaft. After hardening, the shafts are centerless ground by passing through a battery of seven machines.

Valve push-rods for the V-8 engine are of solid, one-piece construction with rounded ends to insure good seating in the lifter and rocker arms. The rods are made from 9/32-inch diameter, S A E 1045 steel, coiled wire. The wire passes through an Ajax-Hogue special drawing machine, in which the diameter of the wire is reduced to 0.2555 inch plus or minus 0.0005 inch. Drawing serves to straighten the wire, improve its surface finish, and increase its strength due to cold-working.

The drawn rod passes through a horizontal



Fig. 10. Centerless grinding machine employed to form-grind both ball ends of valve push-rods. Cam-controlled diamond dressers are used.

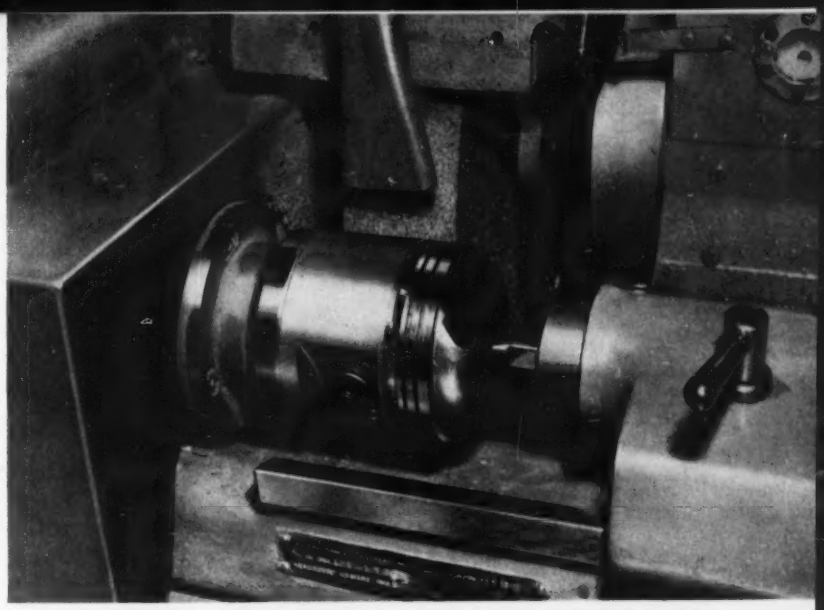


Fig. 11. Permanent-mold cast aluminum-alloy pistons are cam-ground to an elliptical shape to compensate for distortion caused by heat during engine operation.

tube *A*, Fig. 9, and is cut to 10-inch lengths by means of a shearing attachment *B* on a Waterbury Farrel double-end cold-heading machine. Cut-off rods *C* are fed transversely on a shuttle type conveyor *D*. They are picked up, one at a time, by loading fingers *E* and lowered into position between the heading dies. Both ends of each rod are simultaneously rounded to a diameter of 0.378 inch, which reduces the length of the rod to 8.40 inches. Valve push-rods are cold-headed at the rate of forty-eight a minute.

Flats are ground on the ends of the valve push-rods by means of a Besly double-spindle disc grinding machine. Then both ball ends of each rod are form-ground on Cincinnati centerless grinding machines such as the one shown in Fig. 10. This grinder is equipped with a loading magazine and feeding mechanism which lowers each rod onto a tungsten-carbide work-rest blade in position between the two grinding wheels (20 inches in diameter by 1 9/16 inches wide) and the two feeding or regulating wheels (12 inches in diameter by 3/4 inch wide). Cam-controlled diamond dressers automatically true the grinding and regulating wheels to the required spherical radius. About 0.020 inch of stock is removed from each surface, and the ground rods are automatically ejected from the machine. The ball ends on the valve push-rods are then flame-hardened by another Flamatic hardening machine.

Pistons for the V-8 engine are permanent-mold aluminum-alloy castings that are anodized after machining to provide a long-lasting surface. Peripheral bearing surfaces of the pistons are cam-ground to an elliptical shape in order to provide uniform clearance with the cylinder walls at all normal operating temperatures. Cam-grinding of the pistons is performed on Norton hydraulically fed cylindrical grinding machines such as the one shown in Fig. 11. The piston is held by a hydraulically operated drawbar, which engages a pin through the wrist-pin holes, and a tailstock center. Dressing of the grinding wheel is accomplished automatically by means of a hydraulically actuated diamond.

Crank-end bores of the connecting-rod and cap assemblies are finished on a Micromatic six-spindle continuous honing machine. The continuously rotating table of this turret type honing machine holds six work-holding fixtures, one of which is seen in the close-up view, Fig. 12. An operator loads and unloads the fixtures as they pass. When the honing tools enter the bores, the abrasive stones are automatically expanded at a controlled rate, and, as the bores reach the required diameter, expansion stops. Bore size is held to plus 0.0005 minus 0.0000 inch.

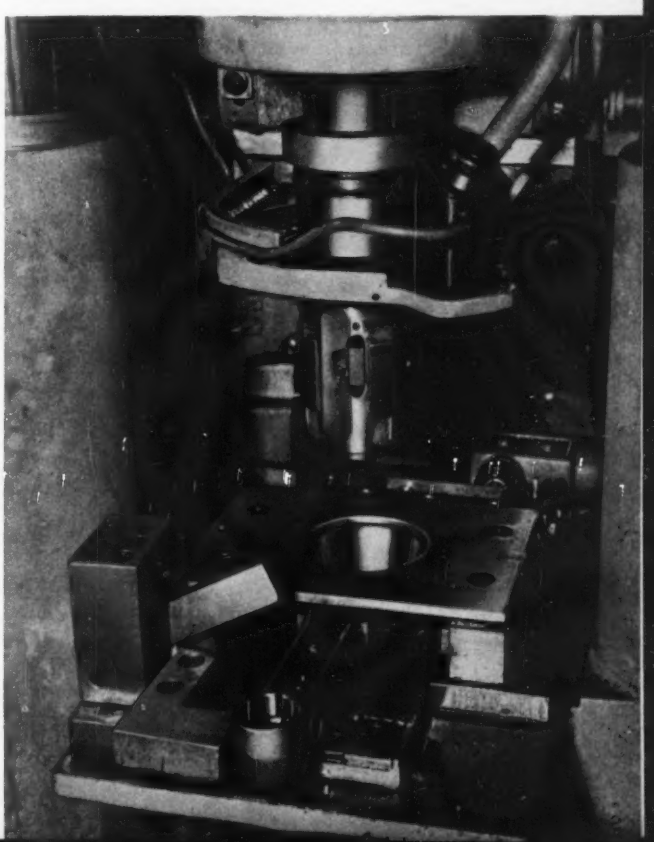
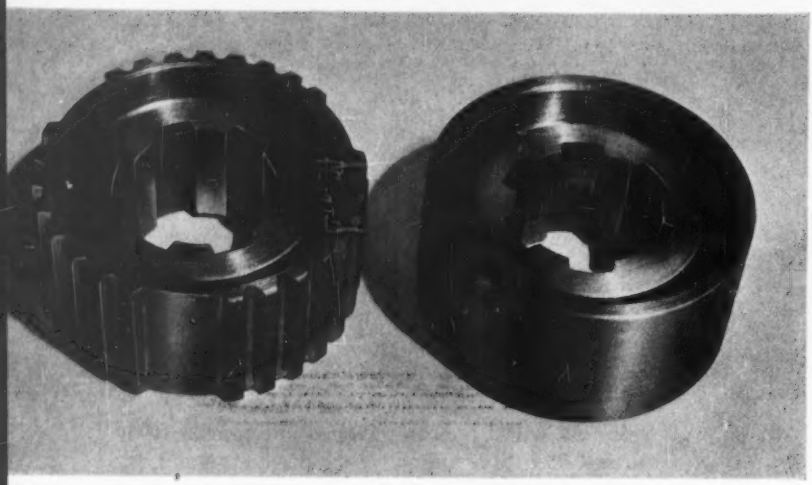


Fig. 12. Close-up view of one work-holding fixture and one spindle on a six-station honing machine used to finish crank-end bores of connecting-rods

Shaping 125 Gears Per Hour



Transmission gears manufactured by Ford Motor Co. are cut at the rate of 125 per hour on one Shear-Speed gear shaper. Before, twelve machines were required to attain the same production.

Fig. 1. Gear produced from the blank seen at the right at the rate of 125 per hour on the gear shaper shown in Fig. 2.

BY cutting all the teeth in two gears simultaneously, a production of 125 transmission gears per hour is obtained from one shaper in the Gear and Axle Plant of the Ford Motor Co., Dearborn, Mich. Previously, an eight-spindle hobbing machine and eleven single-spindle shapers were employed to attain the same production.

The transmission gear, seen at the left in Fig. 1, is made from S A E 1146 steel and designed for thirty teeth having a special diametral pitch of 12 and a 30-degree pressure angle. However, two adjacent teeth are omitted at three places, 120 degrees apart, so that the gear actually has only twenty-four teeth. The gear teeth have an addendum of 0.0357 inch, a whole depth of 0.095 inch, and a chordal thickness of 0.131 inch. Maximum backlash of the gear teeth is maintained within 0.001 inch, and the pitch diameter of the gear (2.500 inches) is held concentric with the major diameter of the internal splines in the bore of the gear within 0.0025 inch total indicator reading. Also, the gear teeth must be parallel with relation to the splines within 0.0012 inch.

Gear-cutting is performed on the Michigan Tool Shear-Speed gear shaper shown in Fig. 2, which is designed to cut all the teeth in two gears simultaneously. Gear blanks, such as the one seen at the right in Fig. 1, are manually placed, two at a time, on a splined arbor and held in position by a hydraulically operated locking device, Fig. 3. Guard doors (removed in both Figs. 2 and 3 to show the details) are then closed and a push-button is depressed to start the automatic cutting cycle.



Fig. 2. Over-all view of the Shear-Speed gear shaper employed to cut the transmission gear shown at the left in Fig. 1

Mounted in the head of the machine is a fixture containing a set of twenty-four formed cutter blades. These blades are assembled radially in the cutter fixture, and are fed inward a preset amount with each upward stroke of the gears. During the downward or return stroke of the work-pieces, the blades are automatically retracted to avoid drag. This is accomplished by means of a drum cam which makes one complete revolution for each stroke of the ram. The blades move back away from the gears after the bottom edge of the lower gear goes above the cutting edge of the blades, and return to the cutting position at the bottom of the ram stroke, just before the top gear blank comes in contact with the blades.

Twenty-one of the blades are narrow, and each of them removes enough metal to form the space between two adjoining teeth. The remaining three blades are wide, and remove metal from the three areas where teeth are not desired. At the end of the cycle, when the teeth have been formed to full depth, the blades are retracted to their starting position.

Since each gear is 1.185 inches wide, and a minimum overtravel of 0.093 inch is required at each end, the total length of stroke of the work-pieces is slightly less than 2 1/2 inches. The work is reciprocated at the rate of forty-eight strokes per minute, providing a cutting speed of about 20 feet per minute. Actual cutting time to complete the two gears is thirty-eight seconds, and twelve seconds more is necessary for loading and unloading.

Radial inward feed of the cutter blades is controlled by a cam that is designed to feed the blades in progressively smaller amounts as the depth of cut increases. The average infeed of blades is 0.005 inch per stroke.

Cutter blades are kept in matched sets, and must be held so that each blade is the same length from back face to cutting edge. Approximately 400 gears can be cut before the set of twenty-four high-speed steel blades requires sharpening, and sets can be sharpened an average of thirty-eight times. Blades are sharpened on their front faces in the same manner as formed tools, maintaining the face angle at 7 degrees. To insure longer tool life, an attempt is made to limit stock removal during sharpening to 0.015 inch. About twenty-five minutes is required to replace a set of cutter blades in the gear shaper.

The quality of the gears cut by this method is comparable to that previously obtained by first rough-hobbing and then finish-shaping the gears. In addition to the savings in machines and manpower, the conservation of floor space is an important factor. One Shear-Speed machine requires only an area of 49 square feet, while the twelve machines formerly required for the same production occupied 213 square feet.



Fig. 3. Gear blanks are held on a hydraulically operated locking device and reciprocated vertically while being shaped by radially fed cutter blades.

Indexing Machine Automatically Welds Tubular Assembly

By BRUNO WEIGHT, Engineer
Expert Welding Machine Co.
Detroit, Mich.

A SPECIAL indexing machine incorporating two welding heads performs a series of submerged-arc circumferential welds in an ingenious manner at the Evansville, Ind., plant of Servel, Inc. The particular weldment, a small three-piece tubular assembly, is used in gas adsorption type refrigerators. The Expert Welding Machine Co., Detroit, Mich., designed and built the machine.

As shown in the diagram, Fig. 1, the assembly consists of a steel generator flue pipe *A* enclosed by two tubelike jacket pipes *B* and *C*, each of which forms an annular space around the flue. Four circumferential welds, as indicated, fuse the jackets to each other and to the flue. All welds are made in a flat position.

A close-up view of the indexing machine, together with the two Unionmelt welding heads, is shown in Fig. 2. (In the foreground can be seen a completed assembly.) The principal element of the machine is a revolving drum *D* from the center of which rises a fixture post *E*. Three right-angle fixture brackets *F* extend from the post, radially spaced 120 degrees apart. Each bracket supports an assembly on an arbor *G* over one of three corresponding spindles *H*.

The drum intermittently indexes counter-clockwise for one-third of a revolution to bring each assembly successively to a loading station at the front of the machine and to two welding stations near the two welding heads *J* and *K*. Each weld is made at a different height on the post, so that by transferring and inverting each assembly between welds, all four welds can be made.

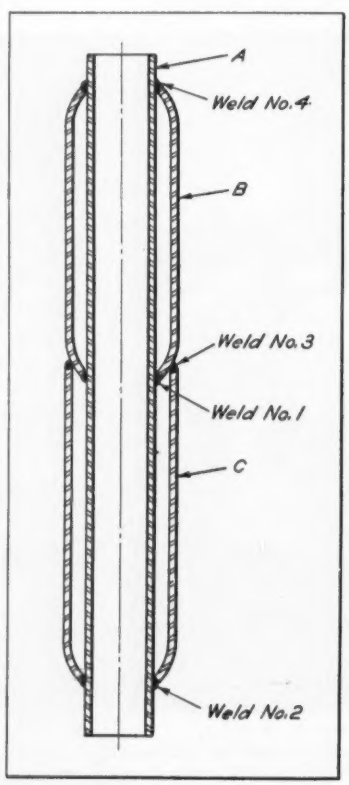


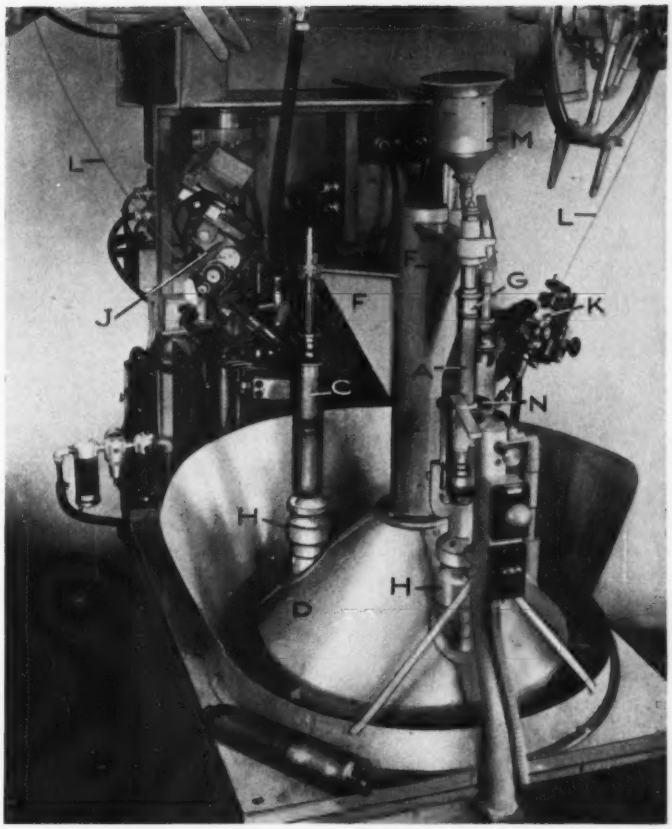
Fig. 1. Diagram showing position of the four circumferential welds of the tubular assembly — three to join the two jacket pipes to the flue pipe, and one to join the two jacket pipes together

After each index of the drum, welding wire *L* is automatically fed to the heads, and granular flux from hoppers *M* starts to flow through solenoid-operated valves onto a flanged disc *N* temporarily placed beneath the immediate welding area. Simultaneously, the two spindles which are at the welding stations revolve on their axes for slightly more than a full revolution. The spindles are then stopped, the flux flow is shut off, and the drum is again ready to index.

Each assembly travels around on the drum three times to complete the welding sequence. In the first cycle, the flue pipe *A* and jacket pipe *B* are loaded in an inverted position in the "high" bracket on the drum, which is then indexed to locate the bracket next to welding head *J* for weld No. 1. (Positions of the welds appear in Fig. 1.) In the second cycle, the assembly is transferred to the "low" bracket, jacket pipe *C* is added, and the drum is indexed to locate the bracket next to welding head *J* for weld No. 2. In the third cycle, the assembly is reversed to its normal upright position and transferred to the "medium" bracket of the drum, which is indexed to locate the bracket next to welding head *J* for weld No. 4, and then to welding head *K* for weld No. 3. Welding head *K* is designed to pivot for the third cycle, to bring the welding wire into arcing distance of the work.

All four welds take only one minute to complete. Production is rapid, since all three brackets are loaded continuously. The clamping mechanisms of the brackets are spring-loaded. Clamps are opened when in the loading station by the ram of

Fig. 2. Two automatic arc-welding heads complete the four welds in three cycles of the machine. One of the tubular assemblies is seen in the foreground.



a stationary air cylinder which is controlled by a pedal valve. Indexing of the drum is also performed pneumatically, and together with the feed of the wire and flow of the ganular flux, is completely automatic. A vacuum system recovers excess flux that drops from the drum.

* * *

Symposium on Radioisotope Application Problems

A two-day symposium, its subject "Management Problems in Industrial Application of Radioisotopes," will be offered on April 30 and May 1 by the Special Training Division of the Oak Ridge Institute of Nuclear Studies. Industrial management personnel of companies interested in incorporating radioisotopes or other atomic energy products into their research or production activities are invited to attend the symposium, which will be devoted to a discussion of those special problems imposed on management by the use of these materials.

Subjects to be covered include dealing with the Atomic Energy Commission (contracts, information sources, and products and services available from AEC), legal problems encountered in radioisotope use, insurance problems, public relations, the role of consulting laboratories, safety and procurement of radioisotopes, and the equipping and staffing of radioisotope laboratories. Those attending will also receive a summary of the course in industrial radioisotopes to be given by the Division beginning on April 20, and will tour the Operations Division of Oak Ridge National Laboratory, the nation's principal source for the production and processing of radioisotopes.

Application blanks and additional information may be obtained from the Special Training Division of the Oak Ridge Institute of Nuclear Studies, Box 117, Oak Ridge, Tenn.

* * *

A United States supersonic research plane flies twice as fast as a pistol bullet.

Conserving Diamond Bort by More Efficient Use of Wheels

The constantly increasing use of carbide tools makes it imperative to conserve the limited supply of bort that is available for manufacturing the diamond wheels widely used in grinding carbides. A recent issue of *Grits and Grinds*, published by the Norton Co., lists four basic means of conserving bort as follows:

1. More efficient use of diamond wheels in conventional grinding by employing conditions which result in the largest possible amount of stock removal from the work per carat of diamond consumed.

2. Substitution of silicon-carbide abrasive wheels for diamond wheels, using conventional grinding practices.

3. Adoption of a new abrasive belt method for "micro-finishing" offhand, single-point carbide tools, thereby eliminating the need for diamond wheels.

4. Consideration of one of the new nonconventional grinding processes, developed for the purpose of procuring greater stock removal per carat of diamond. An electrolytically assisted diamond wheel method of grinding, recently developed, is in this category.

New Horizontal Presses in the Production

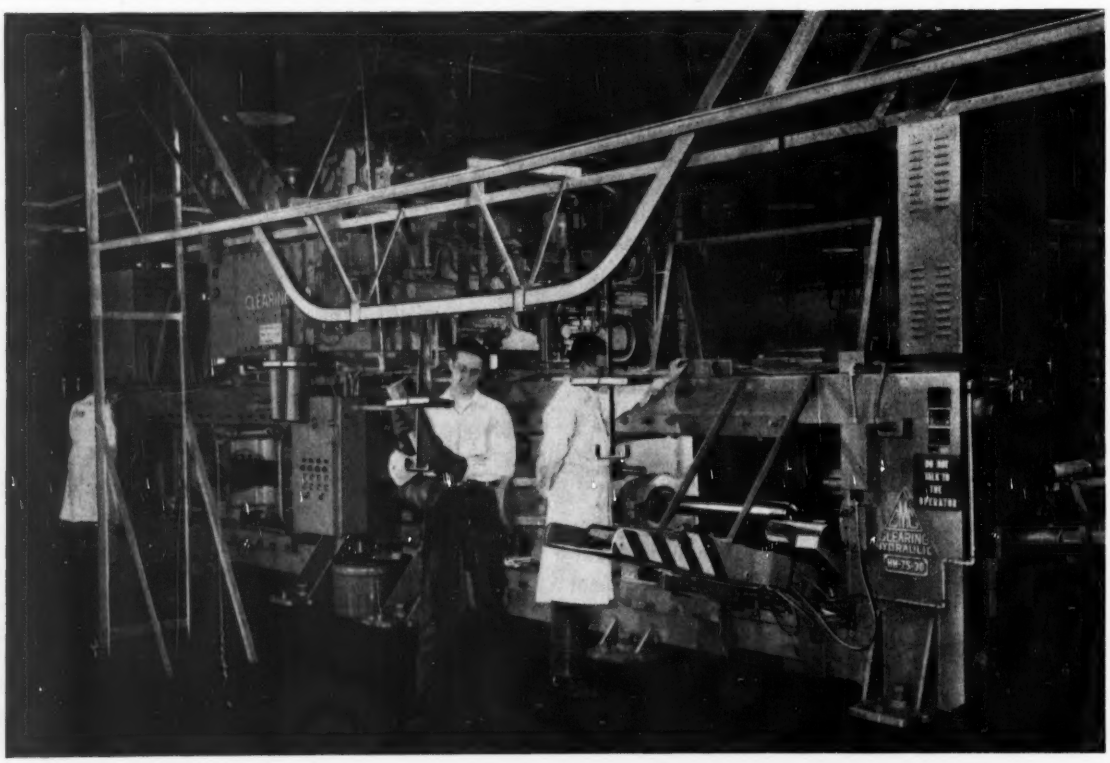
A RADICALLY different press design that utilizes both directions of the stroke is enabling the New Orleans, La., plant of the Rheem Mfg. Co. to produce 90-millimeter cartridge cases in record time. The new presses, designed and built by the Clearing Machine Corporation, Chicago, Ill., are of housing type construction and have a ram which reciprocates in a horizontal plane, working alternately against a die-bed at each end.

While a part is being cupped or drawn at one end, other parts, for the same or for a subsequent drawing operation, can be loaded or unloaded at the other end. Since the ram works on each press stroke, the design eliminates the unproductive time, or "lost motion," consumed by the return stroke of a conventional vertical press. The time so spent is a considerable factor in making 90-millimeter cartridge cases because of the necessarily long stroke required for the final draw length of 24 inches.

Other advantages besides increased production are offered by the new double-end press design. A centrally located hydraulic power unit, driving the ram in both directions, has both an initial cost and a power consumption only half as great as the units of two vertical presses producing at a comparable rate. Furthermore (and important at the Rheem plant because of unfavorable subsoil conditions), installation of the presses is remarkably simple. No foundation pits are required, and the presses are bolted directly to the factory floor.

A low silhouette requiring less than 10 feet of head-room has made the presses easy to accommodate in existing structures. The hori-

Fig. 1. This double-end press delivers up to 330 tons of pressure. Three 75-H.P. motors pump 77 gallons of hydraulic fluid per minute. Four draws convert the original steel disc (0.69 inch thick and 8.875 inches in diameter) into a slender cartridge case 24 inches long. The draw illustrated—the fourth and final—reduces the case area 2.4 per cent and wall thickness 37.5 per cent, and requires 45 tons of pressure.



Eliminate "Lost Motion" of Cartridge Cases

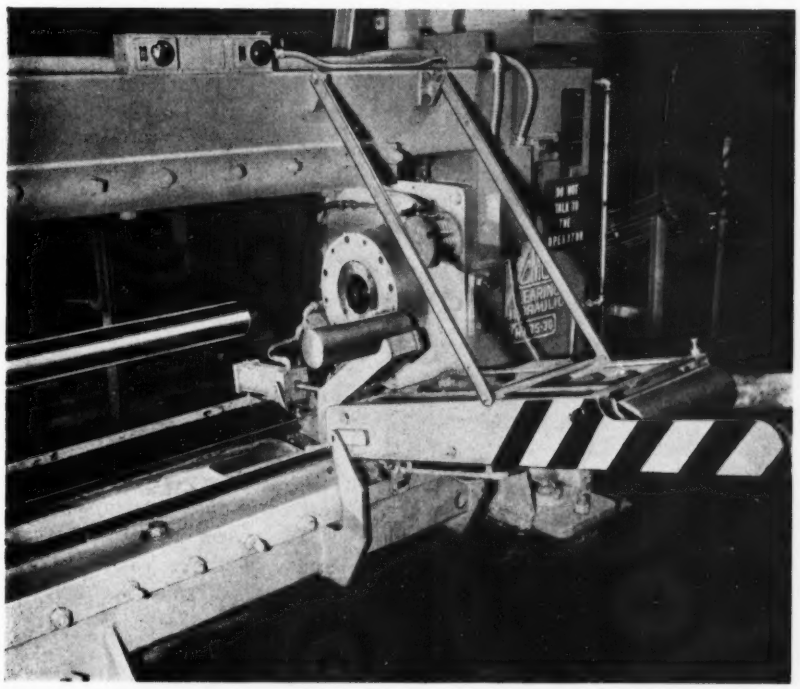


Fig. 2. Close-up view of one end of the press shown in Fig. 1. Parts are loaded into the die-bed by a pneumatically operated paw which lifts them from a feeding chute, and then holds them in position at a centering ring. The punch enters the case, forcing it through carbide dies. Concentricity in this operation is held to 0.002 inch total indicator reading.

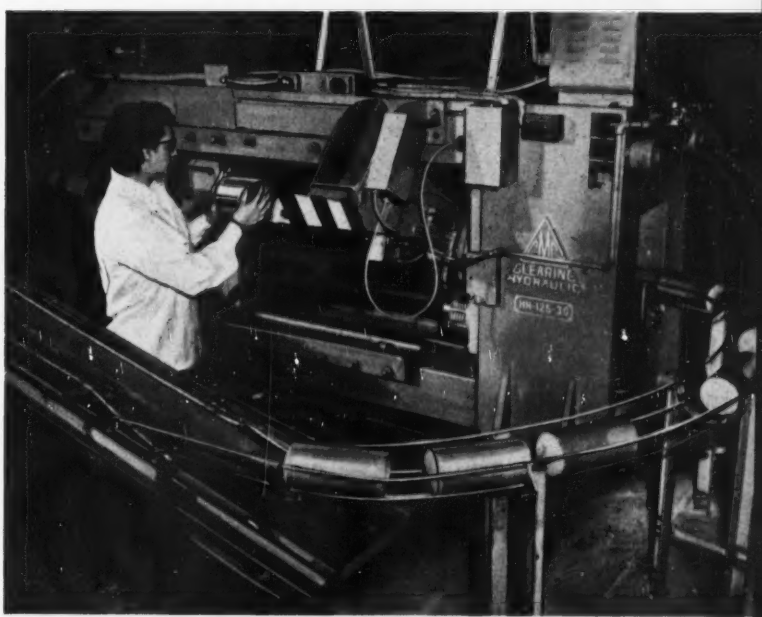


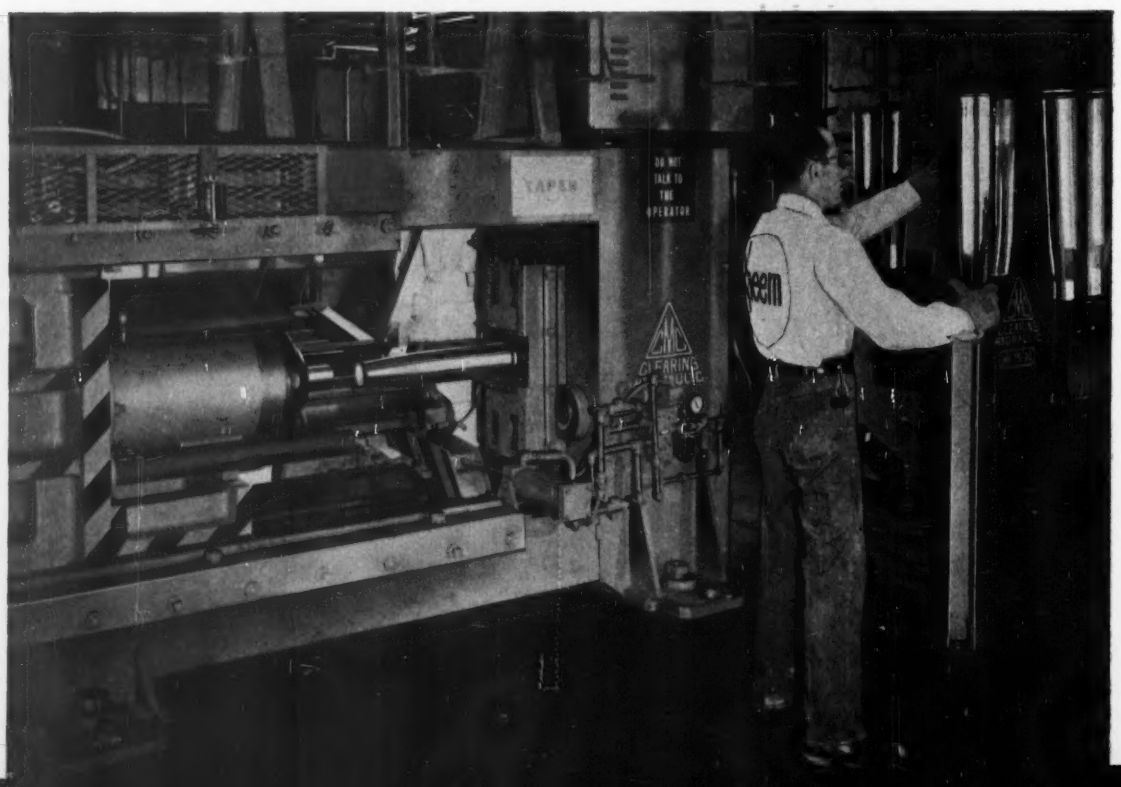
Fig. 3. Here the operator is loading the feeding chute with first-draw parts. The second draw requires 100 tons of pressure, reducing the case area 4 per cent and wall thickness 44 per cent. The press will operate automatically as long as parts are available in the chute. After the cases are drawn, they move down rails and onto a belt conveyor for the trip to the next operation.

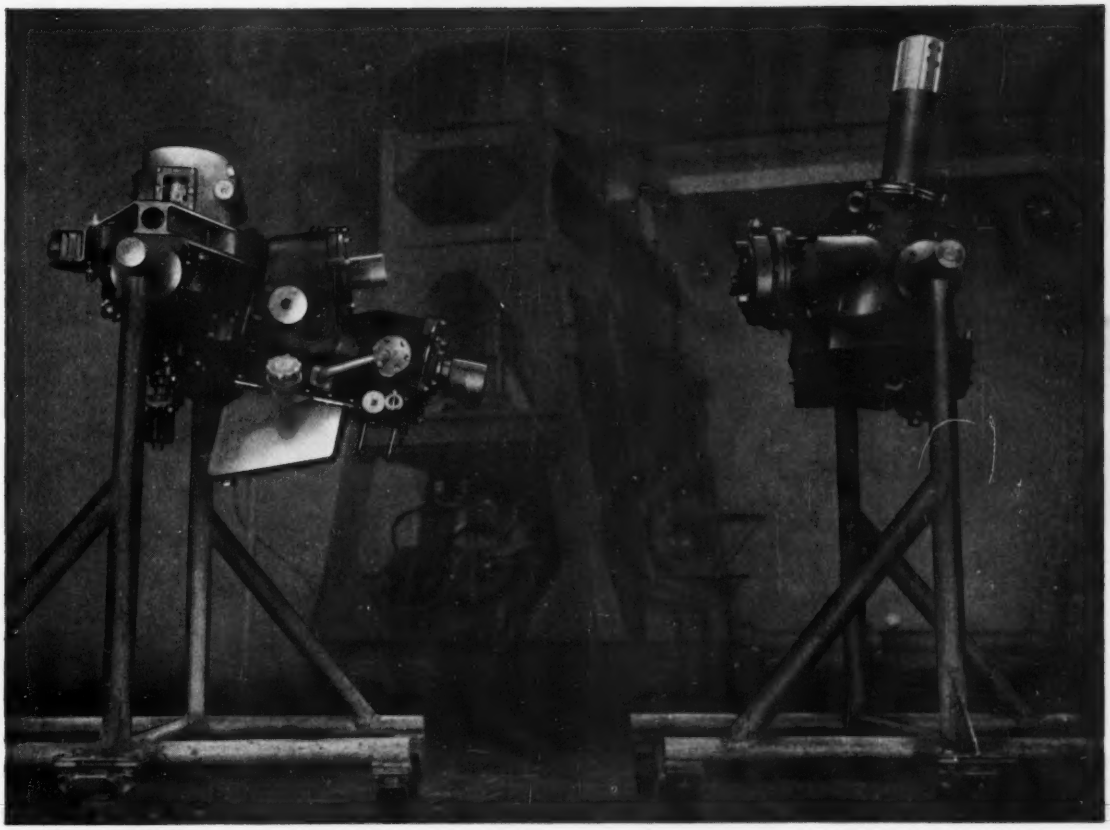


Fig. 4. A unique feeding device has been built into one of the presses. Cartridge cases come directly down a feeding chute into position in front of the die. A pneumatically operated paw holds the parts in the chute until the punch returns to its starting position. When a part is properly aligned, it trips a switch which permits the ram to operate.

zontal construction permits ready adaptation of materials-handling systems. The presses have been equipped with automatic chute feeds that are pneumatically and electrically interlocked with the ram stroke. Pressure is independently variable for each end of the press up to 330 tons per square inch. Each of three 75-H.P. motors pumps 77 gallons of oil per minute.

Fig. 5. After cupping, drawing, heading, and induction hardening operations have been completed, the mouth of the cartridge cases is annealed, the primer hole pierced, and then the mouth reduced by a tapering die to correspond in diameter to that of 90-millimeter shells. A mandrel enters the case end to form a guide for the die and to prevent the case from collapsing. On the return stroke, a 25-ton hydraulic unit built into the slide ejects the case. The operator is shown placing a completed part on a conveyor hanger.





Instrument Makers Turn Talents to Helicopter Transmissions

By EDGAR ALTHOLZ, Associate Editor

BACK in 1914, Navy gun turrets were still firing the "triple-salvo straddle." The first salvo was deliberately fired short of the target, and the second salvo, beyond the target. Then, the position of the target in relation to the points where the two salvos hit the water was relayed to the gunnery officer, who, after some involved and hurried calculations, directed the gunnery crew to fire the third salvo directly at the target. There was plenty of margin for error, even if the officer were a skilled mathematician. Precious time was consumed between salvos, and at least two-thirds of the ammunition carried on the ship was consigned to Davy Jones's locker.

Among those who at that time evinced an interest in increasing the efficiency of Navy gunfire control was a brilliant young design engineer, Hannibal C. Ford, then employed by Elmer A. Sperry of gyrocompass fame. While working on the gyrocompass, Ford developed a system for gunfire control similar to that used between the master gyro and repeaters, which transmitted data from the ship's observation top to the plotting room and the gun turrets.

From Target-Bearing Transmitters to Helicopter Transmissions

After forming his own company in 1915, Ford developed a target-bearing transmitter, the first of many complex mechanisms used in calculating and transmitting—automatically and continuously—the correct gun angle of direction and



Fig. 1. In loading position, the jig plate is away from the column of the machine, and the work is bolted to the upper surface of the jig plate.

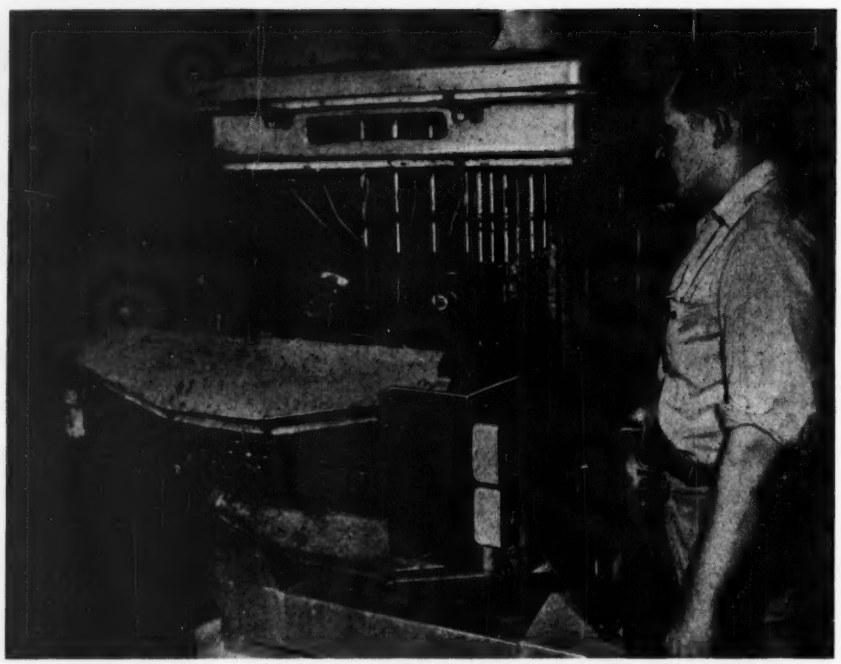


Fig. 2. In the movement from loading to drilling position, the jig plate rotates 180 degrees, then shuttles toward the column of the machine.

elevation for hitting a target. Later, computers and drives were designed to automatically aim the guns where the target would be at the moment the shell burst. With range finders, range keepers, and weapon drives developed which reacted quicker and more accurately than was humanly possible, Ford instruments have ever since helped give the United States Navy a decided advantage over all other navies in gunfire control.

Today the company also produces transmissions for the Piasecki helicopter, designated HUP-2 by the Navy. This model has two lifting rotors arranged in tandem. Some of the tooling and machining methods devised to produce these transmissions are noteworthy. Figs. 1, 2, and 3, for example, show how a typical drilling operation is speedily performed by means of a "flip-flop" fixture. By dispensing with a cumbersome box jig, this fixture combines simplicity of operation and quick-loading features. It is readily adaptable to the various drilling operations in the helicopter transmission.

The fixture embodies a flat jig plate and a slip-spindle plate, through which are drilled the hole patterns of the various required parts. The standard table of a Natco multiple-spindle drilling machine was replaced by a frame which

holds the heavy rectangular jig plate, shown in loading position in Fig. 1.

In this instance, a bolt circle is to be drilled through one of the flanges of the magnesium case of the aft transmission. The work is positioned over a locating plug attached to the jig plate, with the flange to be drilled in contact with the surface of the jig plate.

After the case has been bolted to the jig plate, the operator directs its movement into drilling position from the push-button panel shown at the right. This movement consists of, first, a 180-degree turnover (the "flip-flop") of the jig plate around two trunnions, as in Fig. 2; and second, shuttling of the inverted jig plate to the drilling position a predetermined distance toward the column of the machine, as in Fig. 3.

Both the turnover and the shuttling are produced by air-actuated mechanisms. For the turnover, a gear rack fastened to the piston of a cylinder is arranged on one side of the supporting frame. A pinion meshing with the rack transmits a rotary motion, through miter gears on each end of a shaft, to the trunnions. Near the end of its stroke, the piston engages a hydraulic checking device which decelerates the rotation of the jig plate, in either direction, and cushions it into position.

A pair of air cylinders actuates shuttling of the jig plates. Pistons in these cylinders are connected to the housings which carry the trunnions, and which move over the hardened and ground ways of the fixture frame. With the fixture in the drilling position, the head of the machine, driving all the drills as a unit, descends hydraulically for the feed stroke. Upon completing the drilling of the holes, the head retracts, the fixture shuttles away from the column of the machine, and the jig plate again executes a 180-degree turnover. All movements of the fixture and head are electrically interlocked with micro switches to assure that they are performed in only the proper sequence.

In adapting the "flip-flop" fixture and the machine to the particular operation, the jig plate and the slip-spindle plate of the drilling machine head were each prepared with a circle of holes of the required pattern. The holes in the jig plate were fitted with liners and slip bushings having inside diameters that correspond to the diameters of the drills used; those in the slip-spindle plate were adapted with sleeves which enclose the drill spindles. (Since the spindles are of universal-joint design, the slip-spindle plate serves to maintain the center distances between them.)

Because several different multiple-drilling operations on the transmissions are performed on this drilling machine, both the jig plate and the slip-spindle plate appear to have a conglomeration of unrelated holes. To speed set-ups, masks have been made for each operation; sometimes several operations are required to complete a pattern, and several patterns to complete a part. The mask covers all unused holes, giving the proper position for the locating plug and slip bushings on the jig plate and of the sleeves in the slip-spindle plate. The mask also determines which spindle is to be used for each hole.

Boring Fixture Incorporates Indexing and Clamping Movement

Another outstanding accomplishment in tool design has been the universal fixture shown in the Heald "Bore-Matic" set-up in Fig. 4. In



Fig. 3. Safety interlocks between the fixture and machine prevent the head from descending until jig plate is in the drilling position.

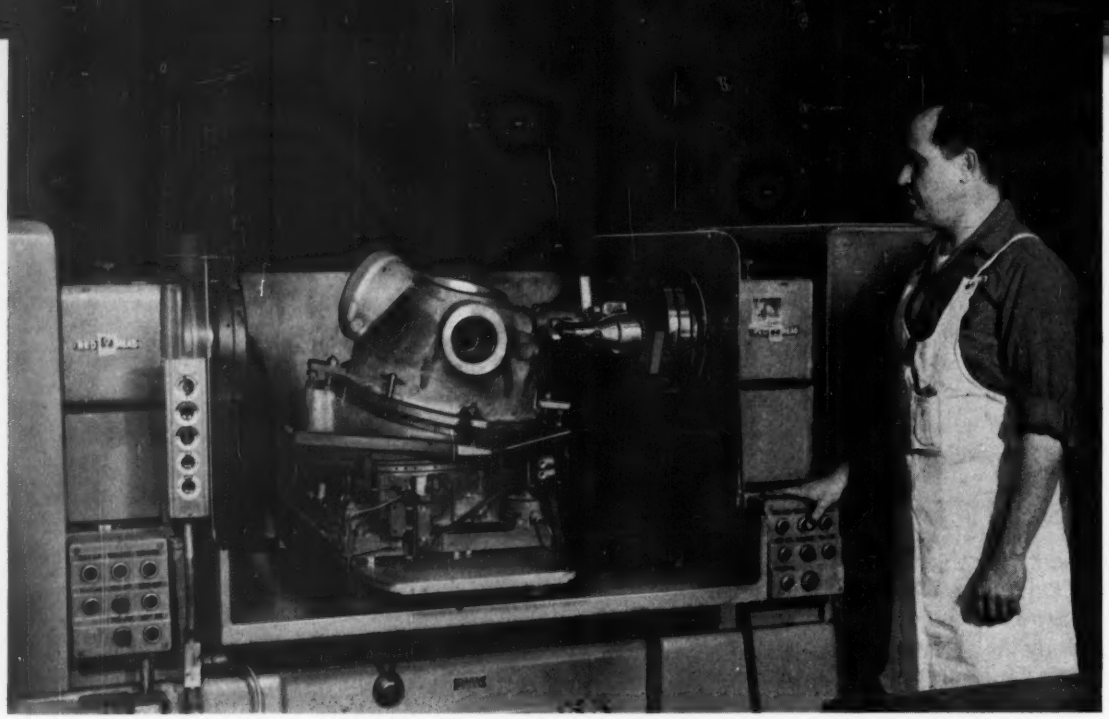


Fig. 4. The table of the fixture can index any particular point on the work directly opposite any one of the four spindles of the machine.

addition to supporting the work, this fixture indexes the work in a horizontal plane so that different areas can be brought into line with any of the spindles. This flexibility permits various operations to be completed from the initial set-up of the work, thus saving many hours of work-handling and assuring that faces, bores, and counterbores are normal to each other.

The body of the fixture is adjustable across an integral base so that it can be brought opposite either of the two front or rear spindles. A circular table on the top of the body can be automatically indexed and locked by toggle clamps. An elaborate pneumatic and electrical system operated by push-buttons controls the entire indexing and locking cycle—the simultaneous pull-out of an index-pin and release of the toggle clamps, the rotation of the table to a pre-set point, the re-engagement of the index-pin and clamps, and finally, the reversal of the table to its initial position upon completion of all machining.

Castings are held either directly on the table or, like the transmission case illustrated in Fig. 4, in special fixtures attached to the table. Most of the weight imposed on the table's rotary ways is absorbed by a special spring and ball in the center of the fixture body. Adjustment is provided to compensate for fixtures that are of different weight.

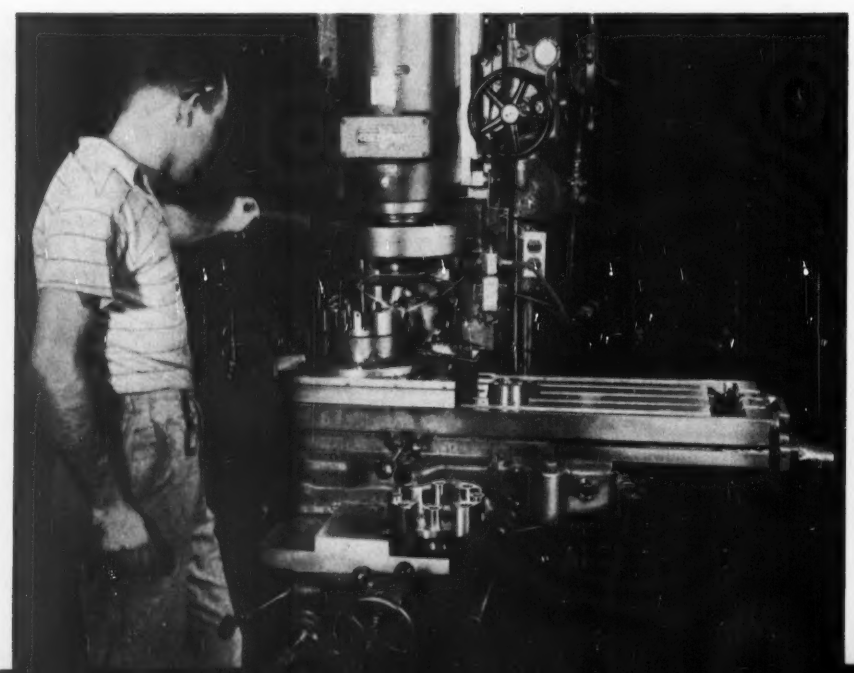


Fig. 5. The evaporation of the liquefied carbon dioxide at approximately —112 degrees F. is a most effective cutting coolant for milling the carrier posts.

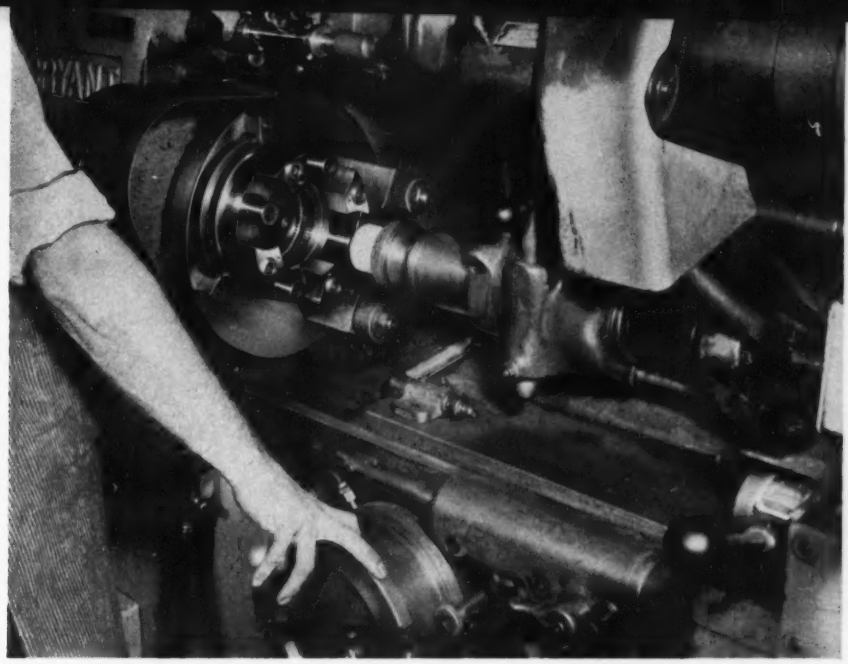


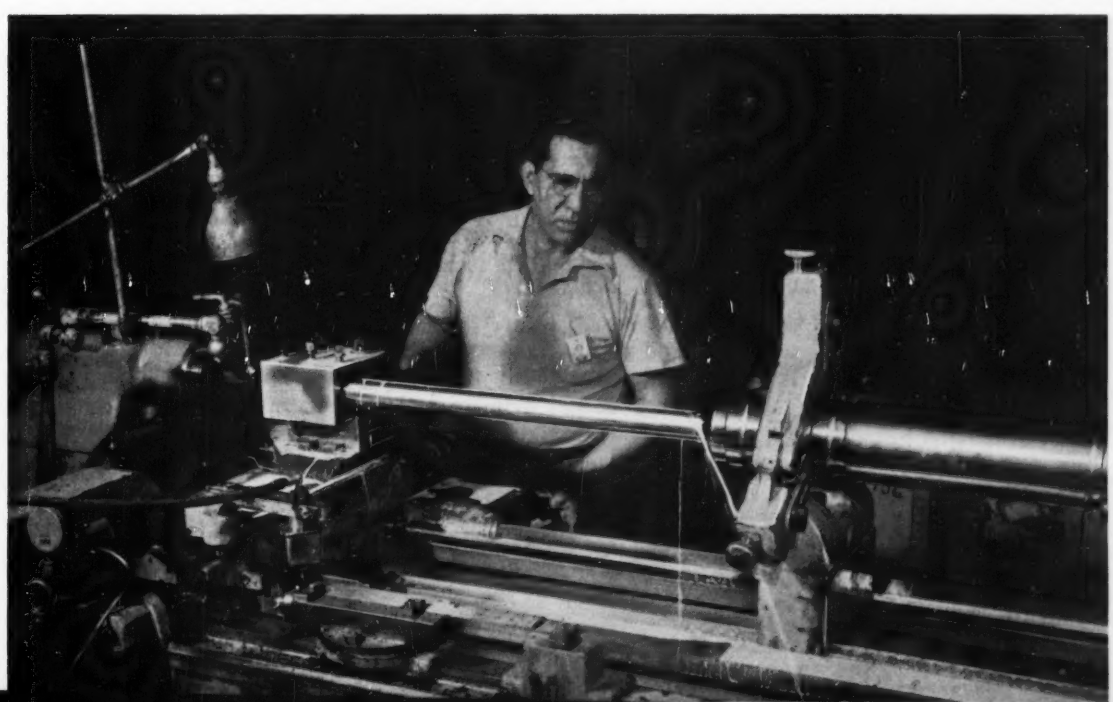
Fig. 6. The application of a hollow wheel permits this internal grinding machine to perform an external grinding operation.

Molybdenum Forgings Used Extensively

Many critical parts of the HUP-2 helicopter transmissions are machined from tough molybdenum-steel forgings. To obtain the proper grain structure in the finished parts, the rough forgings are made substantially over size—finished parts average only 20 per cent of the weight of the rough forgings. Also, the parts when finished must be entirely free from distortion. Specifications require that the steel be brought to the proper degree of hardness (34 to 38 Rockwell C scale) before any finish-machining operations are attempted. The two problems of having to remove an unusually large amount of metal in roughing and of having to cut relatively hard metal in finishing call for optimum conditions of cutter material, cutter design, and coolant mediums, and for full utilization of machine tool horsepower.

One of these parts, a bevel gear, requires annular grooves to be machined in the area between the hub and the teeth. Single-point cutters, because of a necessarily severe overhang, failed rapidly. The tool eventually developed consists of a short length of tubing of appropriate outside diameter and wall thickness to enter the groove. Two diametrically opposed blades held in serrated slots divide the chip load between them and provide a balanced cutting

Fig. 7. A tube brazed in the channel of the boring-bar directs the soluble oil to the tip of the cutter.



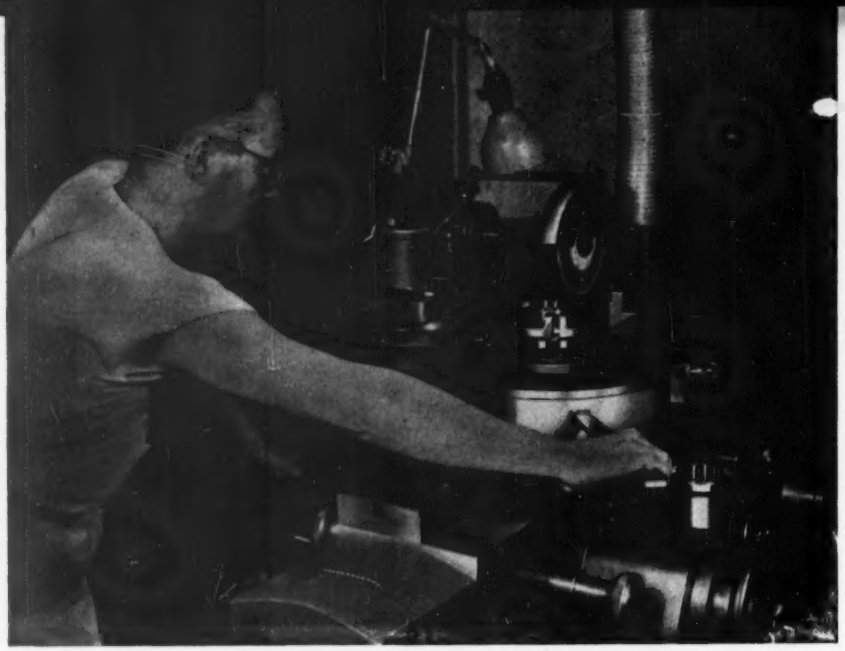


Fig. 8. View illustrates grinding the tooth faces of the drive-shaft clutch. Dressing the grinding wheel on the exact center line of the fixture assures the proper contact of mating clutch teeth.

action. Ample chip clearance has been provided, and the coolant is able to wash the chips back around the outside of the tubing.

Another typical part—unquestionably one of the most important elements of the helicopter transmission—is the planetary gear carrier. It is made of S A E 4340 steel and weighs about 40 pounds as a rough forging. A carrier set up on the table of a Cincinnati vertical milling machine is shown in Fig. 5, where a finishing cut is being taken over the posts which hold the gears. (A completed carrier can be seen on the knee of the machine.) For the operation, a hollow-mill having four carbide butt-brazed cutter tips is fed down to an accurate stop. A flywheel integral with the cutter-spindle assists in producing a quality finish.

Carbon Dioxide Spray Cools Cutter

Carbon dioxide has proved to be an excellent coolant for machining the hard metal of the carrier. Two of the four tanks of the carbon dioxide used for this purpose are visible to the right of the milling machine. The tanks are connected in series to a regulating valve, delivering liquefied carbon dioxide at a temperature of approximately — 112 degrees F. Small tubes direct the coolant to the periphery of the cutter, where it impinges on the teeth in the form of an almost invisible spray. The coolant is prepared by filling three-fourths of each tank with chunks of dry ice, capping the tanks, and letting them stand overnight to build up a pressure of from 800 to 1000 pounds per square inch.

Grinding the outside diameter of the posts of the planetary gear carrier following the finish-hollow-milling operation is accomplished by a somewhat unorthodox though highly satisfactory adaptation of a Bryant internal grinder. As can be seen in the close-up view, Fig. 6, the work is supported in a dynamically balanced fixture, one of the posts being in position on the center line of the machine. The grinding is performed by a special Norton hollow wheel; the wheel encloses the post, with the inside diameter of the wheel brought into contact with the post. A second, larger wheel, also hollow, is then set up in the grinding spindle; coolant is fed through the spindle to the outside of this wheel, which is used to grind the bottom face and inside diameter of the cavity. By so doing, a scratch-free finish is obtained—a requirement of all highly stressed aircraft parts.

Tracer-equipped engine lathes make fast work of turning and boring the contours of the rotor shaft forgings. In Fig. 7 is seen one of the Monarch air-tracer lathes ready to take the boring cut. Soluble oil is piped through a small tube brazed in a channel milled in the boring-bar, and effectively cools the cutter tip as it operates in the 3-foot long shafts. To follow the template fixed to the rear of the lathe bed, the spindle rotation is reversed, with the cutter facing upward and working along the back wall of the bore.

One of the most exacting jobs in constructing the transmission is grinding the tooth faces of the drive-shaft clutch. Fig. 8 shows the indexing fixture set up on the Cincinnati cutter grinder used for this operation. A diamond to dress the grinding wheel is set directly on the center line of the fixture, assuring that all teeth are perfectly radial. Precision design of the fixture indexing mechanism maintains a constant circular pitch between all teeth.

How to Design Dies for Trimming Die-Castings

Various methods employed in Great Britain for removing flash from die-castings are here presented

By H. K. and L. C. BARTON

POWER presses for trimming the flash from die-castings should generally have a stroke of 6 to 8 inches, and there should be a generous amount of daylight space. The type of press employed for shallow drawing is usually suitable for trimming die-castings. An ejector mechanism is essential, since otherwise much of the cycle time may be occupied in removing the casting from the trimming die. Presses without this provision are only suitable for gang-trimming the sprays from multiple-cavity dies by using tooling in which the work-piece drops through the die.

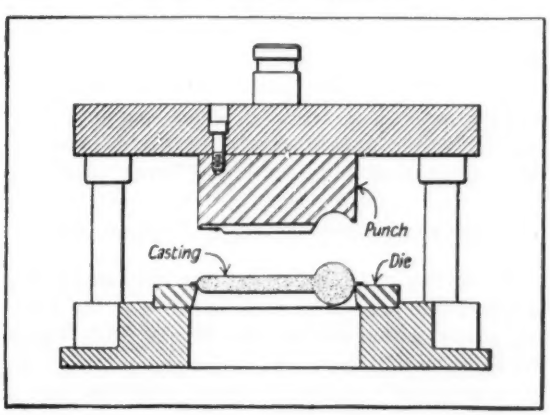
Although drop-through tools are, in operation, the simplest of all, their use in gang-trimming raises difficulties not encountered in single-impression work. A single-impression punch and die set of conventional form is illustrated in Fig. 1. It consists of a standard die set with a plate, cut out to the outline of the die-casting, in the lower member, and a punch of the same outline as the die-casting, attached to the upper member. Whether or not the punch is made to fit the plate opening depends on whether the flash on the die-casting comes off at an edge or, as often happens, part way down a wall, as indicated at (*a*) Fig. 2. In the latter instance, the purpose of the punch is merely to steady and support the die-casting, and it need not conform closely to the die opening.

The die-plate can be finished by hand-filing until it corresponds to the profile of the die-casting, and any tendency for the casting to roll under the punch can usually be corrected by slight adjustments in the relative positions of the punch and die, or even—as a last resort—by dulling the shear edge locally. In a gang-trimming tool, with perhaps twelve cavities, it is virtually impossible to use hand-finished profiles because of the difficulty of maintaining registry. In a drop-through tool it is seldom possible to use a built-up die-plate, with each cavity separately adjustable for center distance and alignment, owing to the lack of support beneath.

How to Match Trimming Dies with Casting Sprays

If the impressions in the die-casting die are sunk from the solid, the best method of insuring registry is to clamp the trimming die-plate to the face of the casting die-block and mill both

Fig. 1. Power press die of conventional design employed for trimming die-castings.



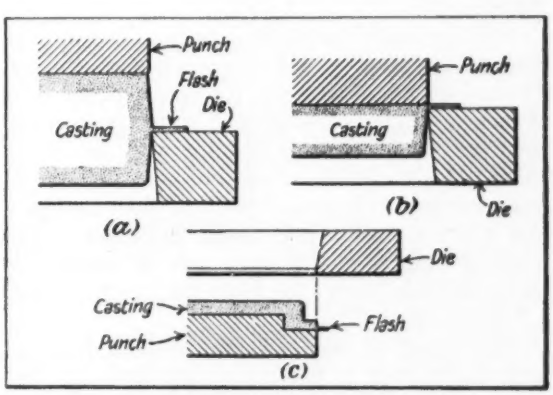


Fig. 2. Views illustrating positions of the flash line on die-castings which determine the type of trimming die that can be employed.

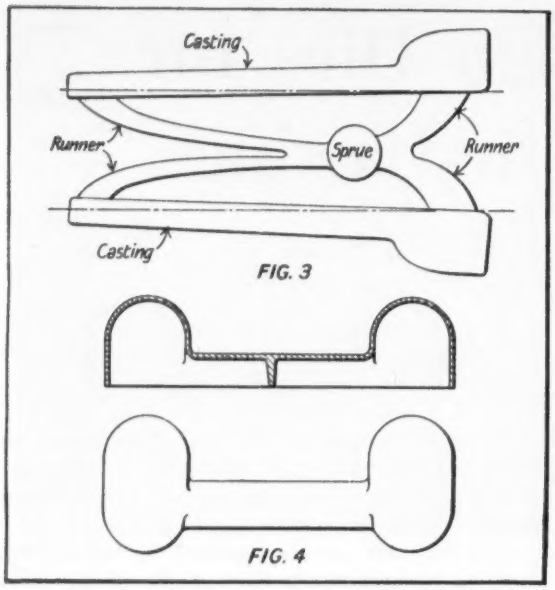


Fig. 3. Sketch showing how large sprays of multiple die-castings may become distorted in cooling. Fig. 4. Normal shrinking allowances should not be relied on for parts of the construction here shown.

together. When each cavity is hobbed individually in an insert or in any die where cavities are sunk by hobbing, this method is not practicable.

It is then necessary to transfer the actual center distances and cavity alignments from the die-casting die to the trimming die-plate, and to set out the profile of the impression from a sheet-metal template prior to milling the plate. It is desirable to make a "match-plate" pattern from the face of the die-casting die for finishing and checking the trimming die. This can be produced easily by surrounding the die-block with a temporary wall and pouring on enough molten zinc to give a thickness over the whole face of about 1/2 inch. When cooled and removed, this plate bears positive replicas of the half-castings.

The methods described are satisfactory for small to medium sprays of shallow castings, but if the length and width of the spray exceed 8 by 8 inches, a sufficient degree of accuracy in registration cannot be obtained by working direct from the die, owing to cooling contraction. If the casting is relatively deep, and the punch and die are not closely registered, the sides of the casting nearest to the sprue will be shaved for some distance before the flash line meets the face of the trimming die.

In a spray of zinc-base die-castings, the normal contraction is 0.006 inch per inch, so that if the center distances between the cavities are 6 inches when measured on the die-casting die, the center distances between the castings on the spray will be approximately 5.964 inches. Allowance for this discrepancy must be made when laying out the trimming tool.

Effect of Spray Distortion

In simple sprays, when the castings are arranged at equal distances from the central sprue and are fed by radial runners, it is sufficient to allow for the normal shrinkage given above. The behavior of the runner metal in cooling varies. Not only does the actual degree of shrinkage tend to vary inversely with the section of the runner, but runners of curved form are often distorted.

Thus, with a two-cavity die fed by double runners, one thick and one slender, the original parallelism of the cavities may be lost in the spray, so that the castings are appreciably nearer at one end than at the other, as shown exaggerated in Fig. 3.

This distortion of the spray is most marked in castings from combination and multiple-combination dies, in which branched runners of sharply changing section are provided. In making trimming tools for sprays of this type, it is unsafe to work to normal shrinkage allowances, and the cavity profiles should not be laid out until sample castings are available for dimensional checking. This is the safest course even with single-cavity trimming dies for certain castings, an example being afforded by a part of dumbbell shape seen in Fig. 4. For such a casting, if the outside dimensions must be held within close limits, the trimming tool can be constructed to the drawing size with the knowledge that, should discrepancies arise, they must be corrected in the die-casting die.

A drop-through trimming die normally has a flat face, since this facilitates regrinding, but on a large gang-trimming die for trimming twelve or more castings at a time, it is advantageous to step the punch faces as shown in Fig. 5. The difference in level need be only about 1/16 inch. The effect of this modification is to insure that the two outer rows of castings are sheared before the punches contact the inner rows. By this simple expedient the power required for trimming is halved, which is of considerable advantage when a pneumatically operated press of long stroke but small power is being used.

Trimming Castings from Stepped Dies

When the parting face of the die-casting die is not in one plane, the shearing face of the trimming die cannot usually be flat, as this would result in castings tilting under the punch. An exception can be made, however, when the punch

enters the casting for a considerable distance, in the manner shown in Fig. 6, and can provide adequate support for the die-casting even though shearing commences at one end only. Similarly, when a casting with a curved flange is to be trimmed, it is possible to use a flat-faced die if (1) the body of the casting fits snugly into the recess of the punch; (2) the gate is on the edge of the casting that is trimmed last; and (3) the runner is supported by spring-loaded pins during the stroke.

In cases other than these, the shearing face of the trimming tool should conform generally to the parting line of the casting, although minor deviations are permissible and in some cases desirable. If the parting line is similar to that shown by the double line of example (*a*) in Fig. 7, with rounded recesses, the recess in the trimming die is preferably made with a greater radius so that the straight lengths x are trimmed at an angle rather than in a direction parallel to the plane of the flash. Similarly, when a die-casting has a stepped parting line as at (*b*) in Fig. 7, the die should be beveled at the junction between the two levels.

Horn Type Trimming Tools

Die-castings that are cored out in the same plane as the parting line are not suitable for trimming with drop-through tools unless the wall section is thick and the outside contour provides adequate means for locating the casting beneath the punch. Many such castings, however, are of thin section and generally of circular form. For castings in this category, horn type tools have usually been found to give better results than drop-through dies.

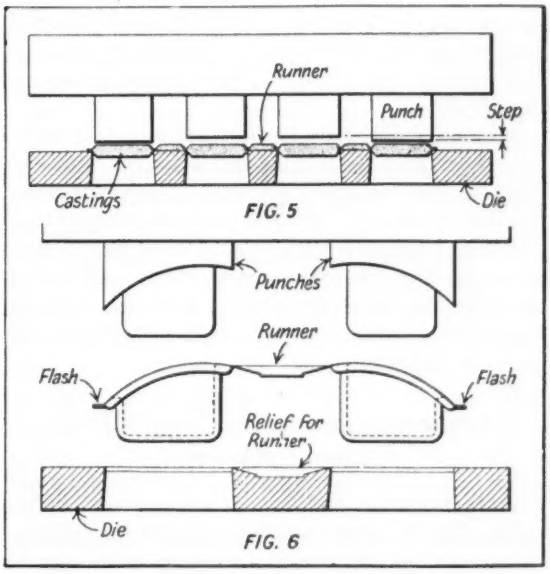


Fig. 5. The outer castings of these multiple sprays are sheared with this die before the inner castings. Fig. 6. Castings with irregular parting lines may be trimmed with flat dies if they are rigidly positioned by the punches.

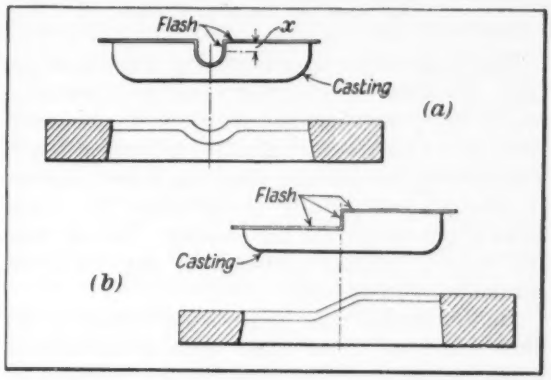


Fig. 7. Examples of trimming dies designed with rounded recesses and two trimming levels

The simple horn type tool shown in Fig. 8 consists of a lower die-plate profiled to suit the die-casting, a sliding block that passes through the die-plate and its supporting bolster, and a horn (or locating spigot) upon which the casting is mounted. The sliding block has a reciprocating movement, and at the lowest point of its stroke the center line of the horn is about 1/8 inch below the shearing face of the die. At the highest point, there is sufficient clearance between the die and the horn to enable the trimmed casting to be removed.

A horn type die set may cause distortion of the casting unless the horn is made a good fit in the cored recess. For deep castings it is desirable to provide a stripping slide. A yoke is fitted over the horn and behind the upper edge of the casting, and the lower ends of the yoke are secured to a horizontal U-shaped slide, which straddles the die opening as shown at *S*, Fig. 9. The slide is spring-loaded. When the trimmed casting has returned to its upper position, slide *S* is drawn forward against the springs to strip the casting from the horn, and is allowed to return to its normal position before the next casting is loaded.

A simpler method is to provide a horn with a hole throughout its length (generously bell-mouthed at the rear) and to push the casting off with a short length of rod inserted from the back. When this method is employed, there is always the danger that the operator will forget to remove the rod before operating the press. Accordingly, the bolster should have a groove behind the horn-slide to prevent the tooling from being damaged.

The Use of Inverted Dies

The most widely used trimming is the inverted style, in which the shearing member is mounted above the punch instead of below it. Inverted dies are of particular value for trimming large, box-shaped die-castings, since the lower member of the die can readily be arranged for withdrawal out of the die for loading. In this way not only is loading accelerated, but the press stroke is often halved.

In the simple type of inverted trimming die shown in Fig. 10, the upper member consists of a box bolster with the shearing die mounted on its lower face. Within the bolster is a spring-loaded plate that contacts the top face of the casting near the beginning of the stroke and holds it securely down on the locating block or punch. At the end of the stroke, the stored energy of the springs is sufficient to prevent the casting from lifting with the die. The stroke of the press must be sufficient to permit lifting the casting clear of the locating block, although the actual cutting stroke is, of course, only a fraction of an inch. Usually the die overlaps the shear edge of the locating block by about 1/8 inch.

An improvement on this type of die is shown in Fig. 11. Here the spring-loaded pad is omitted, and, in its place, two pivoting plates are fitted above the shearing die, one on each side of the bolster. The locating block has high walls,

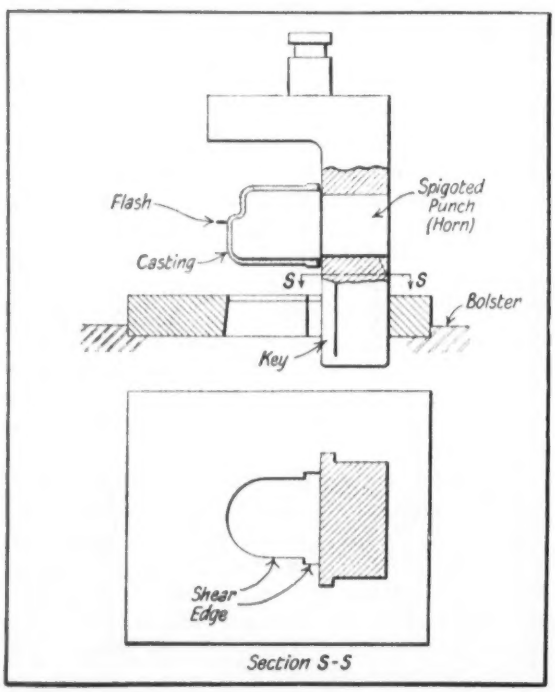


Fig. 8. Trimming die with a horn for supporting cup-shaped die-castings during the shearing operations

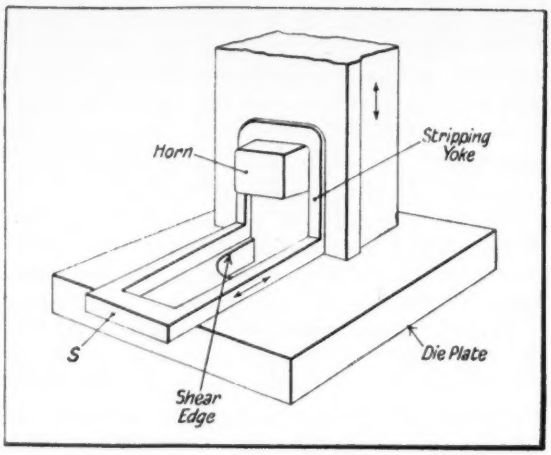


Fig. 9. Diagram of sliding yoke provided on horn type trimming dies for stripping the castings from the horn

and the stroke of the press is sufficient to allow the trimmed casting to enter the bolster for some distance. The pivoting side-plates, which are lightly spring-loaded, are displaced as the casting enters the bolster, but fall back into place at the end of the stroke. On the up stroke, the casting is retained within the bolster and, at the completion of the movement, is pushed out through the open end of the bolster into a chute.

Dies of this type are quick-operating and safe, but unfortunately they can only be used when the flash is sheared against the metal of the casting. If the locating block has a shear edge, the pivoting side-plates cannot fall into place below the flange. To overcome this difficulty, it is necessary to fit the locating block with spring-loaded pins (Fig. 12) so that when placed in position the casting is at least 3/8 inch above its shearing level.

As the die descends, it carries the casting down to a firm seat before shearing begins, but the casting is thrust up again as soon as the die has finished shearing. In this position the pivoting plates can come into action and draw the casting clear on the upward stroke. This method of stripping is primarily of value for such parts as switch boxes and similar castings which embody parallel flanges.

Inverted Trimming Die with Sliding Lower Member

As previously mentioned, an inverted trimming die is often constructed with a sliding lower member, so that the locating block can be drawn forward for loading. Such a die is shown in Fig. 13. The construction is simple, the location block being provided with projecting keys usually formed by mounting the shaped block on

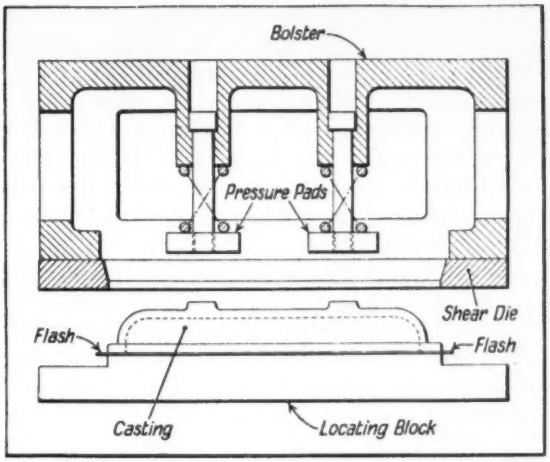


Fig. 10. Sectional view of an inverted trimming die set of simple design.

a flat plate of slightly greater width, as here shown. The keys are guided by two ribs of inverted L-section attached to a fixed baseplate. Handles on the front of the locating block are used to draw it forward. The handles should be attached near the ends of the block so that it would be difficult to pull the slide out with one hand only.

Registry of the top and bottom die members is assured by a pilot-pin mounted at the rear, which should be tapered at one end to take up minor displacements. It should be long enough to pass through the sliding plate and into the fixed base before shearing begins. This pin does not provide a complete safeguard against die damage, because the press might conceivably be operated with the locating block so far out of position that the pilot-pin would clear the rear edge. It is accordingly desirable to interlock the pedal control with a bolt actuated by the returning slide so that the press cannot be operated until the sliding member is thrust fully forward into position.

Frequently it is possible to dispense with a locating block formed to the inside contour of the cavity. Where a casting has three or four cored holes on the under side, it may be satisfactorily located by means of small pegs on the punch-plate, as seen in Fig. 14. These pegs should preferably be shouldered below the level of the plate so that the casting can bed down on the plate even if there is flash around the holes.

Combined External and Internal Trimming

The dies so far described have been types that remove flash only from the outside edges of castings. It is, however, common to employ dies which trim internal and external openings at the same time. Internal trimming normally entails little change of design, for all that is necessary is the provision of a punch mounted in the upper die member and a die in the locating block. The latter is frequently a simple sleeve on which the casting is supported, as illustrated in Fig. 15.

It will be noted that the flash on the die-casting is here adjacent to the under side, a recess having been cored in the fixed half of the die-casting die. When flash is formed at the top surface of the casting it is necessary, in order to provide a true shear, to reverse the positions of the punch and die. To shear the flash against the inside wall of the cored hole is not generally good practice. With the punch in the lower die member, however, provision must be made for forcing the casting downward over the tool, and it must be stripped after trimming.

General principles to be followed in designing trimming dies of this kind are exemplified in Fig. 16. This die trims the outside edge and shears the flash from recesses cored from both the upper and under sides of a die-casting.

The lower member of the trimming die is fixed to the press table instead of being arranged to slide. The die-casting is located on the shouldered pegs ***P***, which can slide freely in the baseplate and project for some distance below it. The pegs rest upon compression springs ***S***, so that they normally support the casting at a height of 3/8 inch above the shearing edge of the punch-plate.

A fixed punch *B* mounted in the plate carries a stripping sleeve as shown. Aligned with punch *B* is a steel column of almost identical diameter,

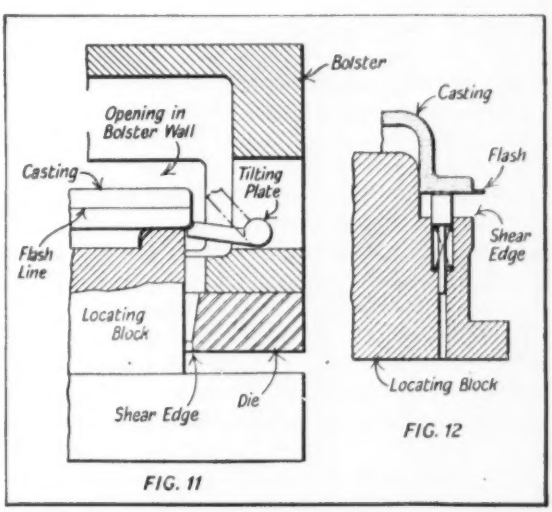


Fig. 11. Die in which the casting is held within a bolster through the up stroke and pushed out into a chute at the end of the operation. Fig. 12. Spring-loaded pins lift the casting from the trimming edge.

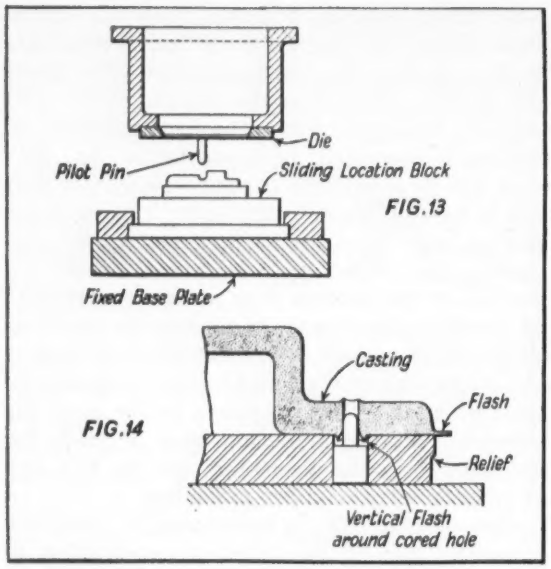


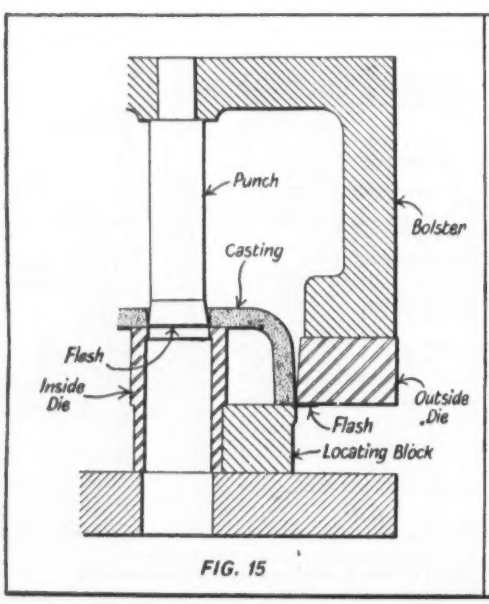
Fig. 13. Sketch showing how deep castings are preferably trimmed in dies having a sliding lower member. Fig. 14. Recessed locating pins on the lower die member provide sufficient clearance.

on which die D is arranged to slide. At the moment when shearing starts, the rear face of the die is supported by a shoulder on the column, but at other times the die is held forward by a spring. Within the column is a spring-loaded plunger which serves to eject the disc of flash from the die.

To the right is seen the bottom-mounted die D' which is permanently secured in the punch-plate. The shearing face of this die is at such a height that the under side of the casting reaches it at the moment when the flange comes into contact with the punch-plate. In the upper bolster a corresponding punch is secured, and this, too, is provided with a spring-loaded stripping sleeve. The depth of the punch is such that it does not come into operation until the outside of the casting has been sheared.

The operation of the tool is simple. The casting is placed in position over pegs P, resting on them and on the sleeves surrounding the bottom punches. The upper part of the unit is then lowered, and the spring-loaded dies D, together with the spring-loaded stripping sleeves, come in contact with the top face of the casting. The latter is thus held between two sets of spring-loaded elements and, if the pressures of the springs in the two die members are balanced, the casting is forced downward, at half the rate at which the top tool is descending, until it meets the punch-plate. Spring pressure is not critical, however, and it is not important whether the top die contacts the flash before the bottom of the casting touches the punch-plate, or vice versa.

As soon as the flash has been trimmed from the periphery of the casting by the outer die, the interior punches come into action and shear the flash from the holes. The up stroke then begins, the spring-loaded sleeves in the top die member preventing the casting from being carried up by the outer die and the top punches. The bottom punches hold the casting down on the punch-plate with the springs around pegs P compressed.



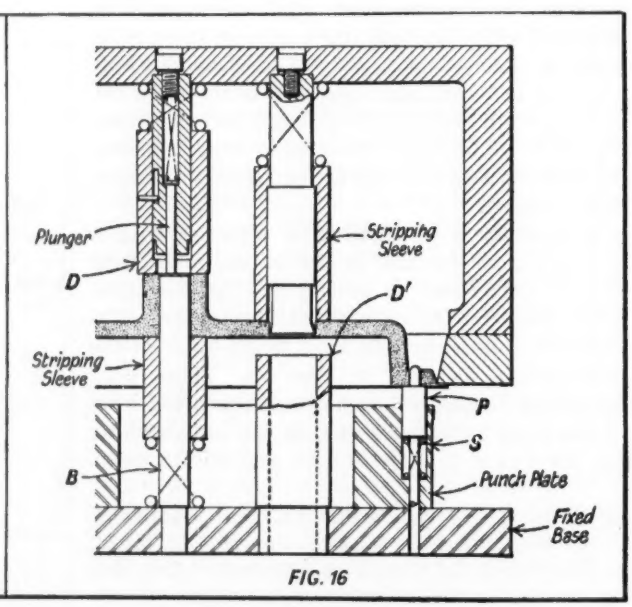


Fig. 15. Details of a die which is designed for trimming both external and internal flash with one stroke Fig. 16. Details of die which trims outer edge of a casting and simultaneously cuts flash from corded holes

Near the top end of the stroke an ejector blade (not shown) beneath the press table contacts the lower ends of the pegs *P* to strip the casting from the bottom punches, whereupon it may be lifted from the die. An air blast clears the trimmed flash from the die.

Multi-Station Trimming Dies

Speed of trimming can be increased on medium-sized die-castings that are awkward to load by the use of two-station dies. The lower portion can have either a reciprocating or a rotary motion, but for most purposes the reciprocating is preferred. With this type of tooling, the inverted die is fixed to the press head, and a pair of locating blocks is mounted on a common sliding base. Either location block can be brought into registry beneath the die.

The transverse movement of the blocks is usually effected by hand, and when ejectors for the trimmed casting are necessary, they, too, should be manually actuated. The main disadvantage of two-station dies is that loading and unloading must be performed on both sides of the press, the positions alternating with each stroke. This is tiring to an operator, who must swing his body from side to side and use both hands to manipulate the casting.

Tools with rotary indexing bases overcome this difficulty, since unloading and loading always take place at the same station. In practice it is found most economical to provide a three-station set-up (load, trim, unload) with two operators. Indexing is then automatic, and even with castings measuring 18 inches square, machines can be operated as fast as forty strokes per minute without undue fatigue.

Tool Engineers to Hold Twenty-First Annual Meeting in Detroit

INCREASED productivity and cost reduction will be emphasized in the technical sessions at the twenty-first annual meeting of the American Society of Tool Engineers to be held in Detroit at the Hotel Statler from March 17 to 20. More than twenty papers will be presented covering many new fields in which tool engineers are now actively engaged. According to L. B. Bellamy, national president of the Society, these broadened interests by tool engineers have come about as a direct result of the increased productivity and lower cost that is being achieved by injecting production know-how into fields related to tool engineering. Among these fields are product design, metallurgy, and cost control.

Eight of the papers in the program stress highly productive metal-working processes. Some in this group are: "Equipment and Tooling for Contour Forming," by O. C. Turchan, director of research and development, Turchan Follower Machine Co.; "An Evaluation of Spinning versus Drawing," by J. H. Lengbridge, project engineer, Aluminum Goods, Ltd.; and "Advances in Precision Boring," by Dr. R. S. Hahn, consulting engineer, Heald Machine Co.

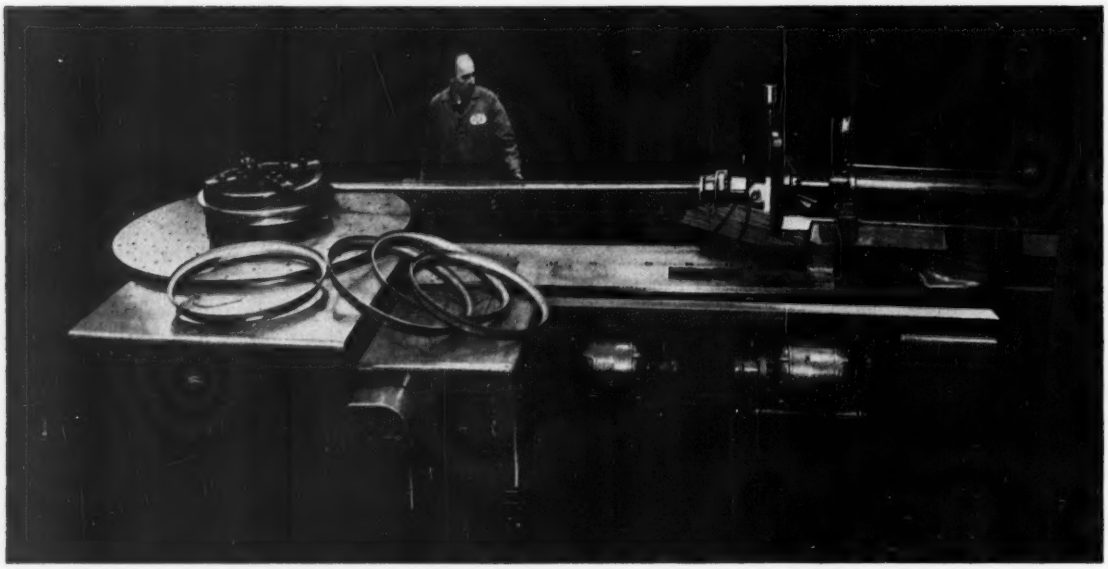
Among the papers considering product design are the following: "Engineering Procedure in Product Designing," by R. L. McWilliams, staff assistant, General Motors Corporation; "Metal-to-Metal Bonding," by O. W. Loudenslager, manager, research and development department, Goodyear Aircraft Corporation; "Rubber Bonding," by J. H. Gerstenmaier, development manager, molded and extruded goods plant, Goodyear Tire & Rubber Co.; and "Tool Engineering Applications of Titanium Carbide Alloys," by W. L. Kennicott, chief engineer, Kennametal, Inc.

There are two metallurgical papers being presented: "Stress Considerations in Contour-Forming," by Dr. George Sachs, director, metallurgical research, Syracuse University; and "Structure as an Index to Machinability," by Dr. Norman Zlatin, partner, Metcut Research Associates.

In the group of papers on cost-reduction concepts are: "Controlling Machine Down-Time," by R. E. Cross, executive vice-president, The Cross Company; "Principles of Automatic Sorting and Feeding," by J. H. Paquin, tool engineering consultant; and "Maintenance Expense Control of Production Tools and Equipment," by E. E. Griffiths, consulting manufacturing engineer, Westinghouse Electric Corporation.

Three seven-member panel discussions in connection with the meeting will deal with problems in production welding and in thread production; and with honing, lapping, and superfinishing.

The technical sessions begin Wednesday afternoon, March 18, and continue with morning, afternoon, and evening sessions until Friday evening, March 20, when the annual meeting banquet will be held. Tours of industrial plants in the Detroit area have been planned for three days.



Jet-Engine Parts Produced with Minimum Scrap Loss

By CYRIL J. BATH, President
The Cyril Bath Co., Cleveland, Ohio

RADIAL draw-forming is receiving increased application in plants manufacturing components for jet engines because this process enables the quick production of circular parts of light cross-section. Close dimensional tolerances can be held readily and wastage of metal is at a minimum. There is no limitation to the metals that can be handled, the process being applicable to the new heat-resistant tough alloys. The process is also suitable for parts used in guided missiles and for a variety of applications outside the aircraft industry.

Typical parts for which radial draw-forming is suitable are shown in Fig. 1. Included among jet-engine parts are outer combustion chamber liners such as seen at the upper left in Fig. 2. This particular part was made from a sheet of Stellite, 3 5/8 inches in width and 0.040 inch in thickness, of Rockwell C 28 hardness, and having a tensile strength of 125,000 pounds per square inch.

The flat sheet is first formed to the required cross-section in a brake die. Then a second operation is performed on a radial draw former such as shown in the heading illustration. The piece is gripped at one end in a jaw attached to a ram which is actuated by the controlled pressure of a hydraulic cylinder. The other end of the straight work-piece is gripped by a jaw attached to the round die mounted on the revolving table of the machine. This die has a spiral path or form around which the work-piece is wrapped as the die revolves.

Before the table is set in motion, however, a second hydraulically actuated ram engages a hard bronze shoe against the metal to be stretched so as to compress the metal between the shoe and the revolving die. The function of this secondary ram is to accurately maintain the cross-sectional shape while the piece is being formed. This is especially important when tolerances must be held equal to those specified for lathe operations.

The rotation of the table compels the part to be formed in accordance with the die shape and diameter. When the ring is finished, the maximum outer circumference is found to have been stretched in linear measurement approximately one-third more than the minimum inner circumference—in other words, what had been a straight strip of tough metal is now a circular piece with an inner diameter of 18 inches and

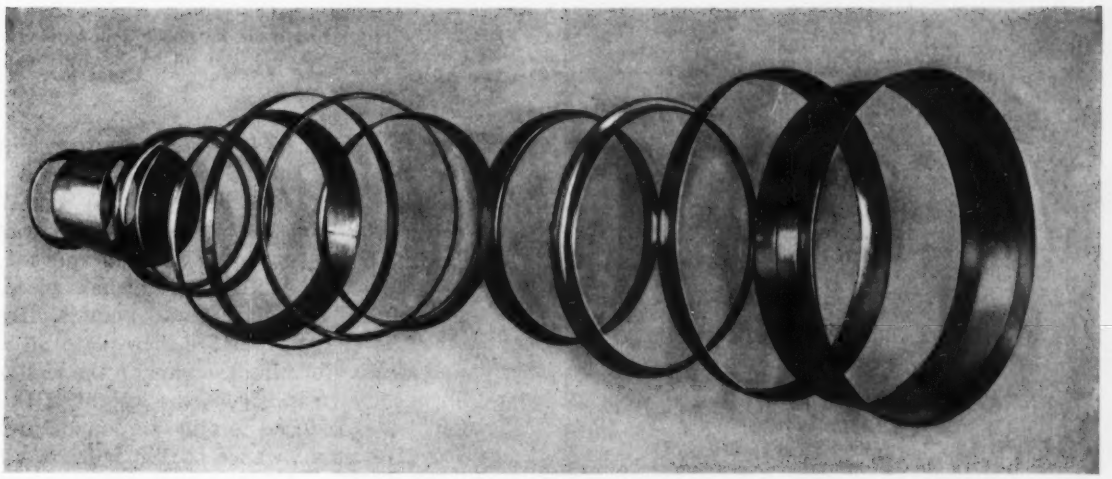


Fig. 1. Circular rings which have been produced by radial draw-forming within close tolerances for application to jet engine

an outer diameter of 24 inches. The metal around the largest circumference has been lengthened 30 per cent more than the smallest circular surface.

Radial draw-forming has an effect on the metal not greatly different from that obtained when metal is drawn in a press. A shape such as the ring just discussed, however, could scarcely be produced from tough metal in a conventional drawing operation, and even if it were, the cost of dies and the tonnage required to do the work free of wrinkles would both be excessive.

The heading illustration shows a machine being employed for manufacturing rings from 93 per cent pure titanium. Out-of-round tolerances of jet-engine rings are generally permissible up to 1/16 inch on a circle 36 inches in diameter when the part is disassembled. When the piece is fitted to a plug gage or to a mating part, the diameter tolerance is more usually 0.005 inch. Being stretch-formed, such rings do not have wavy skirt edges.

Cross-sectional tolerances on a part 36 inches in diameter by 7 inches in width are generally held within a limit of 0.006 degrees in angularity. Most parts formed for jet engines are made



Fig. 2. Components for jet engines made by radial draw-forming, the part in the upper left having been produced from a Stellite sheet



Fig. 3. Gun turret ring made by radial draw-forming with tremendous savings in weight of the raw material as against the weight of the original forged part

from stainless steel having a tensile strength of 100,000 pounds per square inch. It would be virtually impossible to turn such shapes from solid rings, weldments, or forgings because the thinness of the material in relation to the work diameter would defy any attempt at turning with lathe tools.

Radial draw-forming is applicable to heavy stock as well as to material of light gage. For example, the Cyril Bath Co. employs this process in making the spiral dies, stretch-forming solid bars of steel up to 4 square inches in area.

A gun turret ring made during World War II was 36 inches in diameter. When this part was a steel forging, the rough weight was approximately 400 pounds, while the finished piece, turned to size, weighed only 51 pounds. By fashioning the shape from 3/8-inch plate on a brake and stretch-forming the part on the radial draw former shown in Fig. 3, the weight of the rough piece was reduced to only 80 pounds and there was still an allowance of 1/8 inch on all surfaces that required a turned finish.

As stainless nickel-steel extrusions become available in market quantities, various jet-engine rings can be radial draw-formed from these extrusions with a stock allowance of only 1/8 inch or less for an inside turned finish. A typical turbine case ring formed in this manner would weigh only 45 pounds as against a forging with a weight of 245 pounds. This, of course, means a saving of 200 pounds in scrap. Both the formed piece and the forged part would be finish-turned to a weight of 32 pounds. Many shapes could be produced that would combine three or more parts that are now made separately and welded together.

Semicircular parts for guided missiles are formed from one-fourth hard aluminum (53S-H32), brake formed, and then radial drawn by the machine illustrated in Fig. 4. Radial draw-

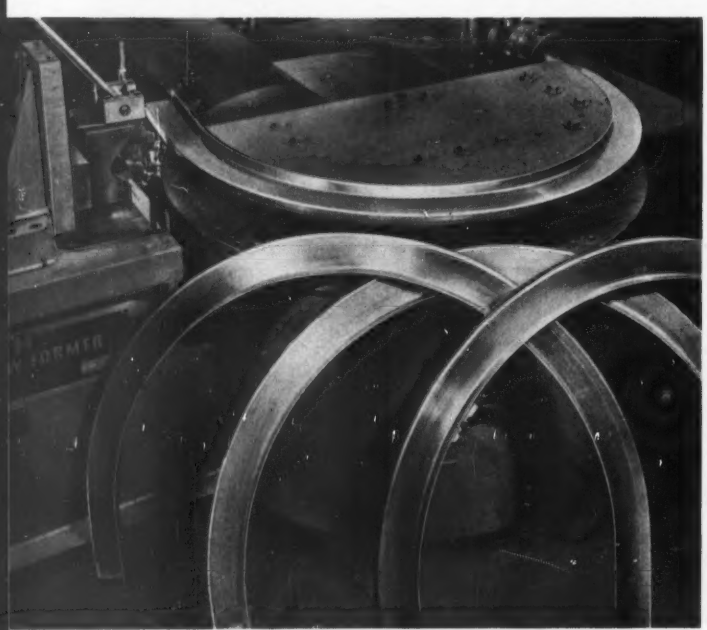


Fig. 4. Semicircular rings radial draw-formed from aluminum extrusions for use on guided missiles



Fig. 5. Bus window frames of irregular shape produced in large quantities by radial draw-forming

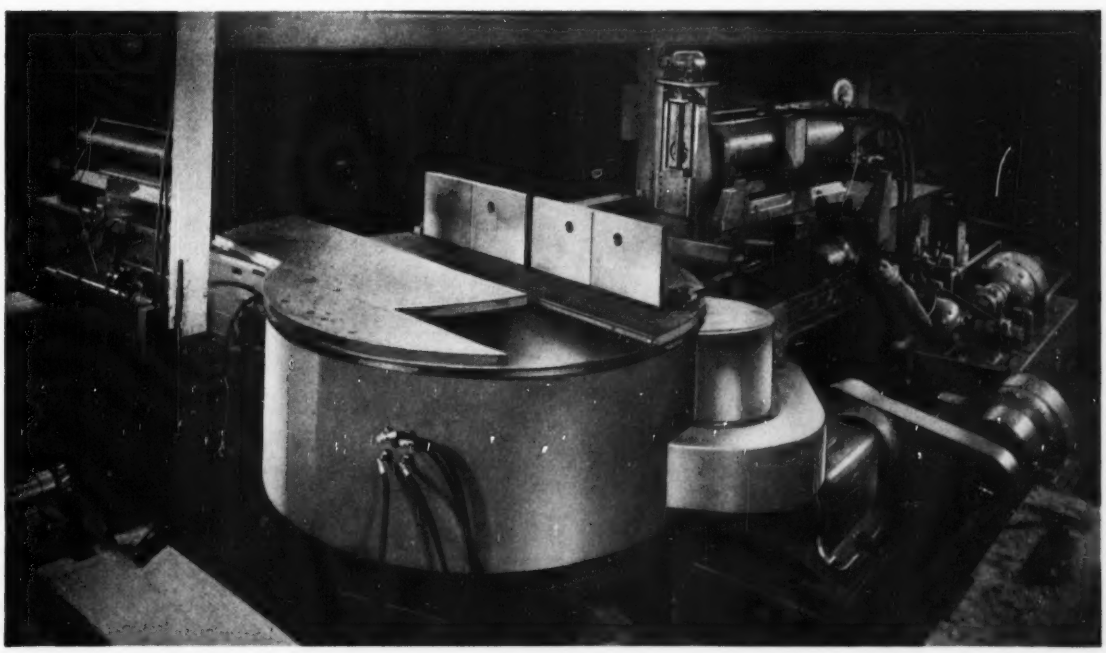
forming is, of course, not confined to circular shapes. Elliptical parts, or irregularly shaped parts like the bus window frames in Fig. 5, can also be produced, and such shapes need not be of constant angularity.

The largest radial draw-forming machine to be built up to the present time is illustrated in Fig. 6. This machine weighs 65 tons and will form circular parts up to 10 feet in diameter. Parts can be stretch-formed up to 22 feet in length by 48 inches in width. Sheets, extrusions, and rolled or brake-formed sections can be made to conform to virtually any round or rectangular pattern, or combination of the two. Reverse bends or form curves in two planes can be produced in one operation, and the machine can stretch and "wipe" simultaneously so as to effect changes in extrusion angularity while forming compound curves.

* * *

Liquid oxygen tanks used on some guided missiles must withstand high pressures at temperatures as low as 325 degrees below zero F. Many of these tanks are made of "K" Monel, a nickel-copper alloy, as the ductility and toughness are unaffected by low temperatures.

Fig. 6. Radial draw-forming machine which has a capacity for forming circular parts up to 10 feet in diameter and for stretch-forming parts as large as 22 feet in length by 48 inches in width



Automaticity Can Increase

Manual effort can be minimized and production increased by the use of automatic controls; automatic jigs, fixtures, and feeding methods; or special machines. Examples of how this was accomplished in drilling two different parts are illustrated and described in this article

FOR the last few decades, the word mechanization has been used to describe the movement predominant in industry to place greater dependence on machine power rather than man power in the production of manufactured items. But today mechanization is rapidly being replaced by a more dynamic trend—termed "automaticity."

Until a few years ago, the greatest emphasis was placed on the development and use of new and better machines, materials, and tools that would permit higher machining speeds, heavier cuts, and coarser feeds—thus decreasing machining time and increasing output. Automaticity has a different meaning. Although tremendous strides have been made in increasing the rate of removing material, rising labor costs and the gradual disappearance of skilled operators have brought about a need for the virtual elimination of the human element in all phases of the operation and a greater utilization of mechanical efficiency with less idle machine time.

A direct approach to the basic problem of increasing production is to view the actual time required to remove material and form, or otherwise shape, a part into the desired condition as the only useful or desired time in a machining operation. This can be designated as cycle time. All other time involved can be called handling time. Since the handling time merely adds to

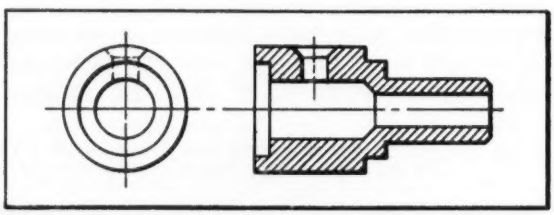


Fig. 1. (Right) Actual machining time required to drill the cross-hole in this part is 1 second. Handling time can be reduced by making the set-up more automatic on fixtures such as shown in Figs. 2 and 3.

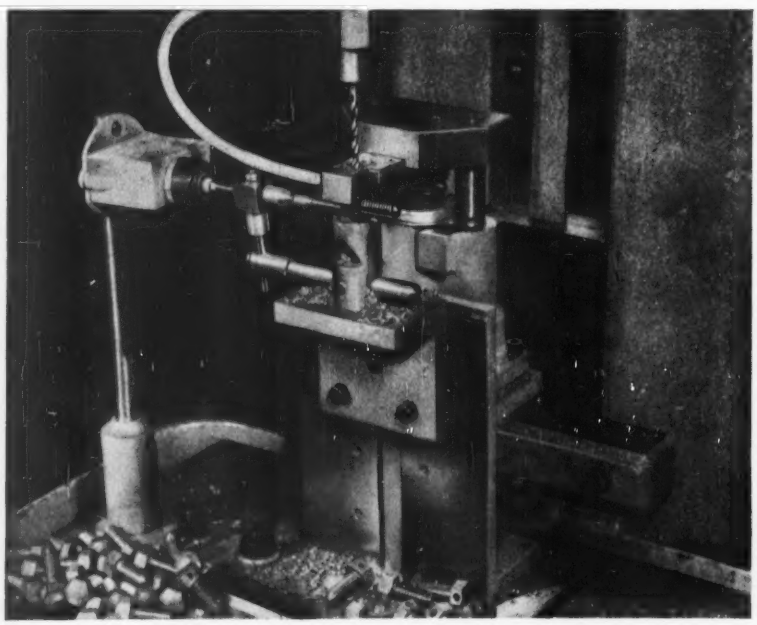


Fig. 2. (Left) Handling time can be reduced from 5 to 1 1/2 seconds by drilling the part seen in Fig. 1 on an automatic drilling machine equipped with a fixture that automatically clamps the work.

Your Drilling Production

By R. H. COWAN, Vice-President
Snow Mfg. Co., Bellwood, Ill.

the cost of the operation, every effort should be made to minimize or eliminate it.

Three developments have contributed substantially to the rise of automaticity and the reduction in handling time. They are:

1. The application of automatic controls to individual machines. Air-operated, hydraulic, and mechanical controls are being utilized to a great extent to motivate and regulate machines. Such controls provide uniformity of operation and eliminate operator fatigue.

2. The adaptation of semi-automatic and automatic jigs, fixtures, and feeding methods. The efficiency of the machine and its productive output are often determined and limited by the ability of the operator to manually load and unload parts into the work-holders. Simplified and standardized fixtures that include basic positioning, holding, and ejection features have been produced and automatically synchronized to the machine operation.

3. The use of special machines. While special machines have been used for many years, their application has been somewhat limited to very large volume production work where high initial expense or operating cost was not an important item in view of the results obtained. As time passes, such highly efficient machines will gain in popularity.

The degree of automaticity applicable to any particular job will depend on three factors: (1) The quantity of parts to be processed at any one time. Larger runs will naturally permit more extensive study and higher investment costs. (2) The total quantity of parts to be processed over a given period. The frequency of set-up of the same job may warrant higher initial expense if production output per set-up can be increased considerably. A 5000-part run repeated several times per year is not a short-run job. (3) Similarity of parts. Relatively expensive equipment that can easily be altered or adapted to cover the entire range of work may also allow amortization of initial cost over several jobs.

Assuming that the proper spindle speed, feed, and cutting tools are applied to any given job, there remains a relationship between cycle time and handling time which indicates whether steps should be taken to improve the production rate. For example, the cycle time (1 second) required to drill the cross-hole in parts such as the one shown in Fig. 1 is short in comparison with the time required for handling when using a hand-fed drill press and a hand-operated clamping jig.

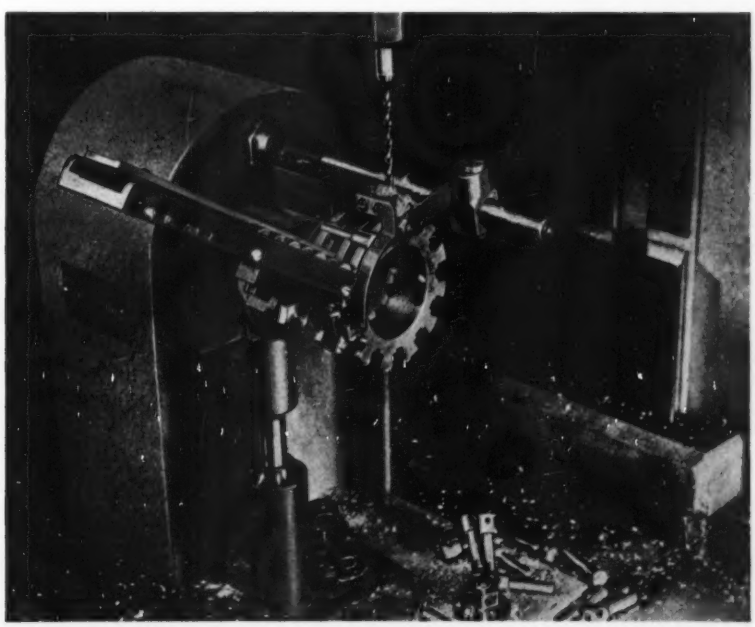


Fig. 3. In this type of set-up, magazine loading and automatic indexing can be used to boost production of part shown in Fig. 1 from 1440 per hour (with a set-up such as seen in Fig. 2) to 3272 per hour.

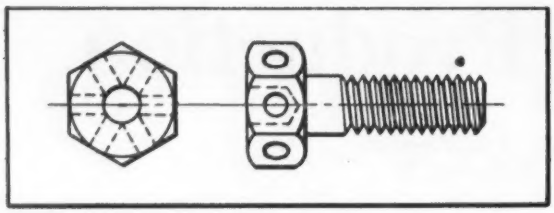


Fig. 4. Cycle time for drilling six holes in the head of this special bolt is 6 seconds. Handling time varies from 14 seconds on hand-fed drill press to 4 seconds with a set-up as illustrated in Fig. 6.

The handling time for this particular part under these conditions is

Loading	1 Second
Clamping	1 Second
Reaching for feed-lever	1 Second
Unclamping	1 Second
Unloading	1 Second
Total handling time	5 Seconds

Added to the 1-second cycle time, this would result in a total operating time of 6 seconds and a gross production of 600 parts per hour.

If the quantity of parts to be drilled is sufficient to warrant the use of an automatic drilling machine with an automatic clamping fixture, similar to the one shown in Fig. 2, handling time could be reduced to

Loading	1 Second
Unloading	1/2 Second
Total handling time	1 1/2 Seconds

Added to the 1-second cycle time, this would result in a total operating time of 2 1/2 seconds and a gross production of 1440 parts per hour. Upon loading the part in this set-up, it contacts a micro switch through a spring-loaded rod, thus initiating the machine cycle and automatically clamping the air-operated jig. The jig automatically opens when the cycle is completed, and the drilled work-piece is ejected.

Even higher production can be obtained if the quantity of parts to be produced warrants the cost of an automatic indexing fixture, like that seen in Fig. 3, mounted on the automatic drilling machine. In this set-up, the work-pieces fall one at a time from a magazine into the slots of the fixture. Indexing is synchronized with the automatic operation of the drilling machine spindle, and, after drilling, each work-piece falls onto the table of the machine. The only non-productive time is the 1/10 second required for indexing, resulting in a total operation time of 1 1/10 seconds, and a gross production of 3272 parts per hour. The addition of a hopper feed to the machine would complete the automaticity of this operation.

It will be noted that the production obtained in cross-drilling parts (such as the one shown in Fig. 1) can be increased over five times without changing spindle speed or feed. It is often the case that the speed and feed can be reduced without loss of production due to the reduction of tool wear and the resultant decrease in "down" time.

In another example—drilling six holes in the head of a bolt of the style shown in Fig. 4—practically the same procedure can be followed in minimizing the handling time. Also, the decrease

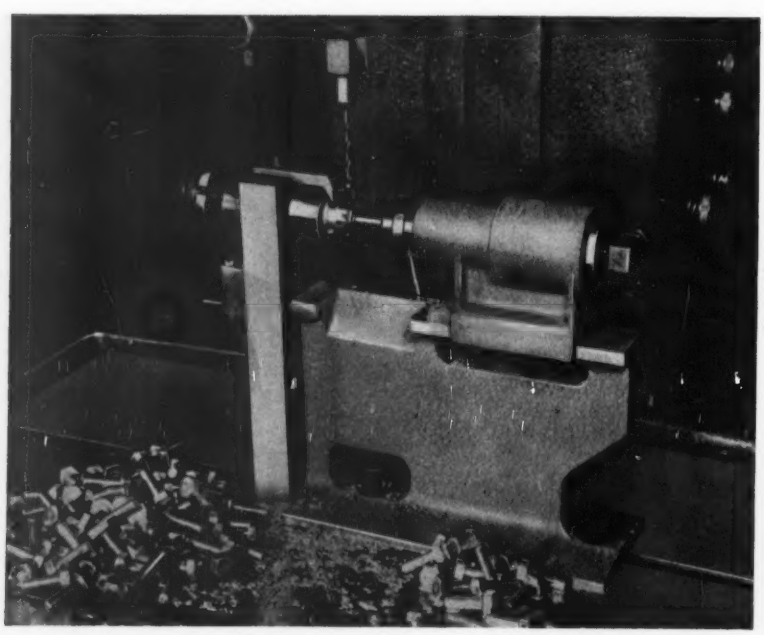


Fig. 5. Work-piece is automatically clamped by air-operated piston that is controlled by spindle of drilling machine. The work-holding fixture is indexed by hand.

in total handling time by simplification of the method permits the operator to run more than one machine.

In drilling such a bolt on a hand-fed drill press with the work held in a conventional box jig, a cycle time of 6 seconds (1 second per hole) is required for drilling, and the resulting handling time would be

Loading	4 Seconds
Reaching for feed-lever	1 Second
Indexing	5 Seconds (Total)
Unloading	4 Seconds
Total handling time..	14 Seconds

Added to the 6-second cycle time, the resulting total operation time is 20 seconds, and a gross production of 180 parts per hour is obtained in this set-up.

If the quantity of parts to be drilled permits the use of an automatic drilling machine and a hand-indexed, automatic clamping fixture such as seen in Fig. 5, the handling time can be reduced as follows:

Loading	2 Seconds
Indexing	3 Seconds (Total)
Unloading	1 Second
Total handling time..	6 Seconds

With 6 seconds required for drilling each part, total operation time is reduced to 12 seconds, and the gross production is increased to 300 parts per hour. Although the fixture used in this set-up is indexed by hand, the work-pieces are automatically clamped by using an air-operated piston that is controlled by the drilling spindle of the machine. Simple adapters can be provided for use with this fixture to permit inexpensive change-overs when performing similar operations on different parts.

Even higher production can be obtained by equipping the automatic drilling machine with a fixture that provides completely automatic clamping and indexing after the part has been loaded, as shown in Fig. 6. With such a set-up, the handling time is reduced to

Loading	2 Seconds
Indexing	1 Second (Total)
Unloading	1 Second
Total handling time..	4 Seconds

This results in a total operation time of 10 seconds and a gross production of 360 parts per hour. Also, the 6-second cycle time would allow one operator to easily feed two machines, and, although not actually doubling production, a gross production of approximately 650 parts per hour could be obtained.

Gross production figures have been listed in each example, since the net production will vary from one operator to another, from job to job, and from plant to plant—depending upon physical and psychological factors, complexity of the operation, and managerial policies and practices. However, each proper step taken toward greater automaticity of operation will improve the efficiency rate, decrease scrap, and—most important—make the operator's job less difficult. It is important to note that the primary objective of each successively improved method has been to reduce manual effort and operator fatigue. Actually, increased production has merely been a by-product of the simplification.

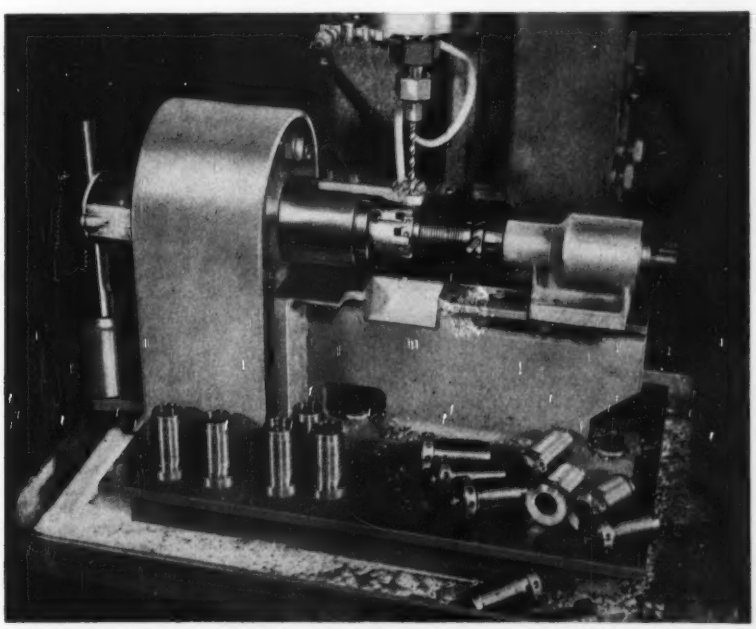
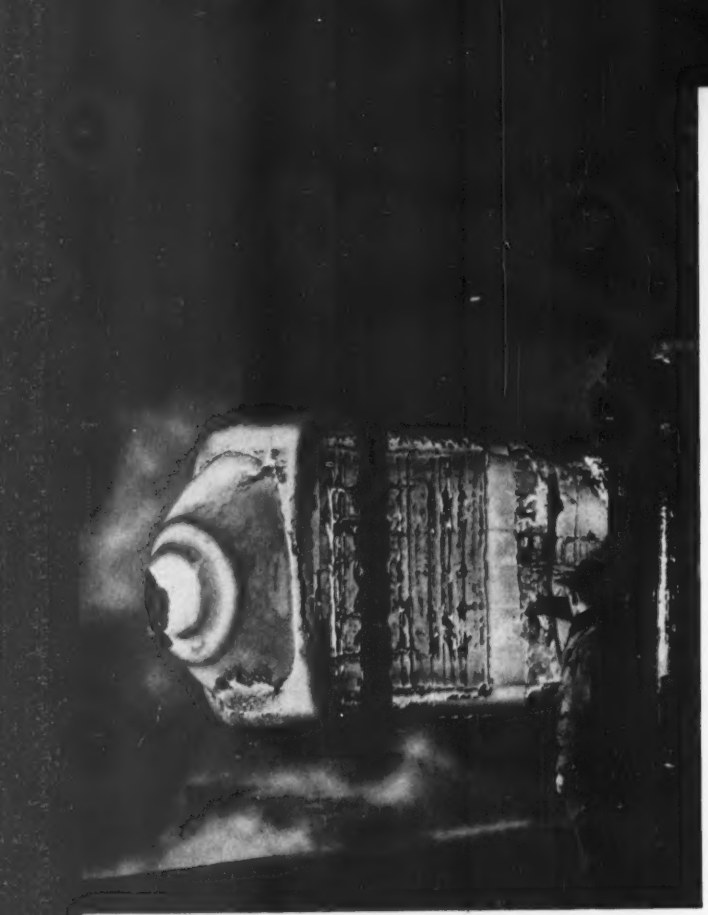
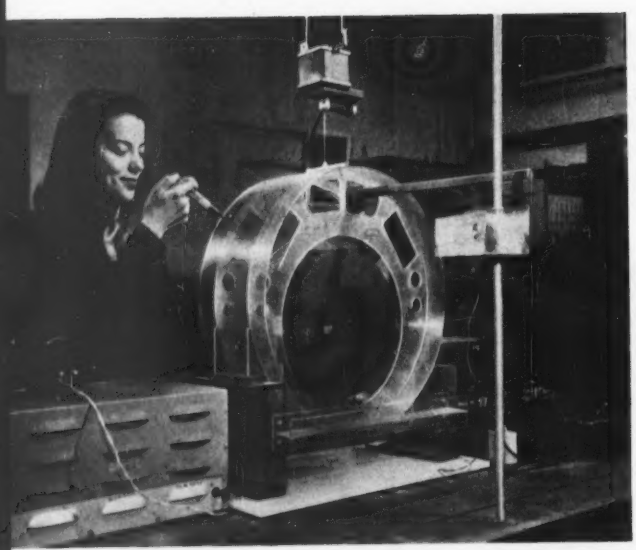


Fig. 6. When work-pieces have been loaded in this fixture, they are automatically clamped and indexed. A gross production of 360 per hour is possible on one machine.

In Shops Around the Country

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation





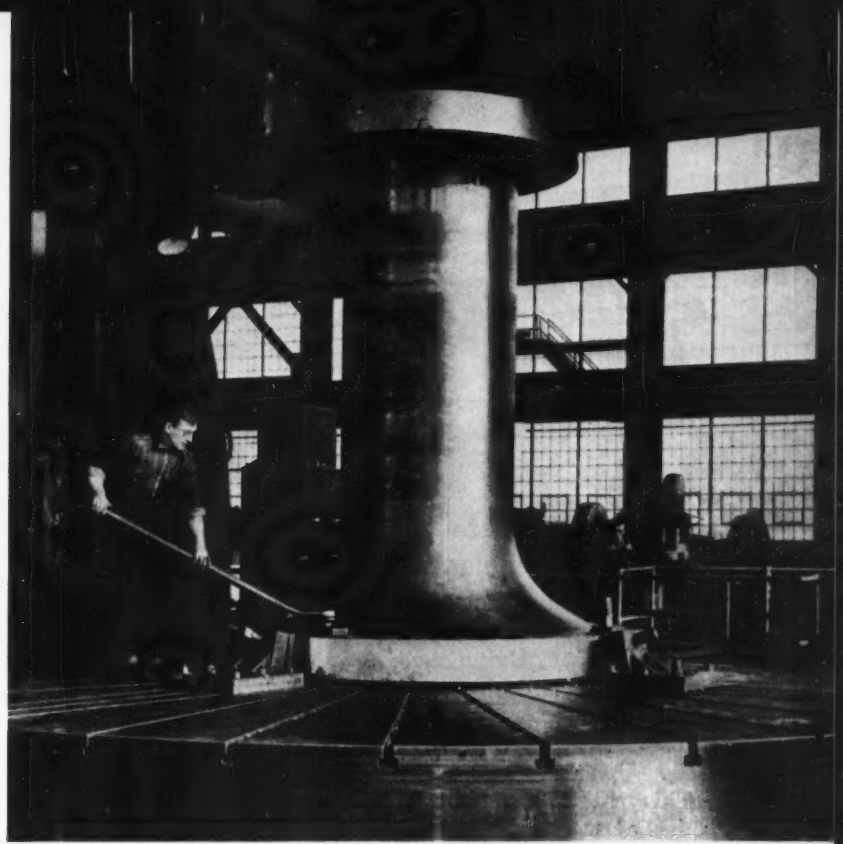
(Top) Massive ingot from a mold 18 feet high by 9 feet in diameter poured at the Bethlehem, Pa., plant of the Bethlehem Steel Co. being forged to shape on a 7500-ton press. When finished, the forging will be 110 feet long, 16 inches thick, and 40 inches wide except for a 100-inch wide foot at one end. Eighteen of these steel forgings, each produced from a 275-ton ingot, will be required for the six columns of a 50,000-ton forging press. This huge press, standing ten stories high, will be the largest in the United States Air Force's heavy press program. It will be used for the production of airplane parts now made by more complicated methods.

(Left) A standard medical hypodermic syringe has been drafted for a novel application at the Research Laboratories of the Westinghouse Electric Corporation—cementing together parts of a plastic model used for investigating effects of vibration on generators and other large electrical machines before the actual units are built. The "shot" of acetone and plastic cement is injected into holes drilled through both parts to be joined. This method helps insure a better job of fixing sections of the model that must withstand vibrations from the electromagnetic "driver" shown at top of plastic frame.

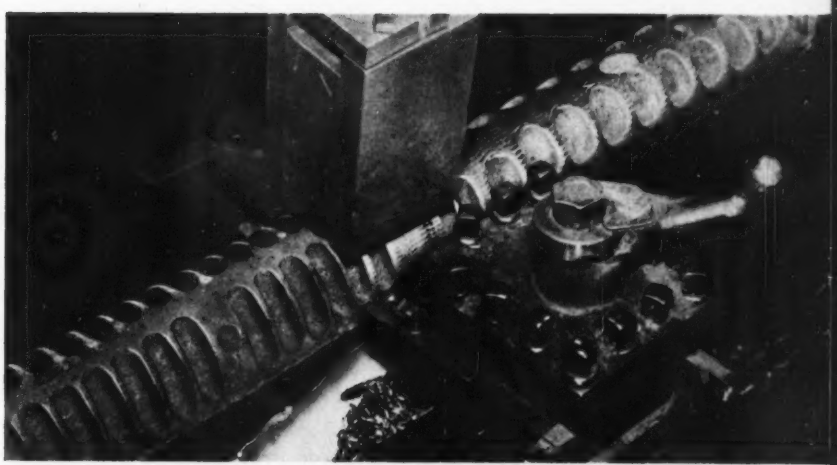


Portable surface resistance indicator made by the General Electric Co. is used by the Spotweld Co., Cleveland, Ohio, to take the guesswork out of spot-welding operations performed in fabricating aluminum parts for aircraft engine covers, refrigerator units for trucks, aluminum tie-rails, and parts for vending machines. Enough pieces are checked in fifteen minutes to last through a twelve-hour welding period.

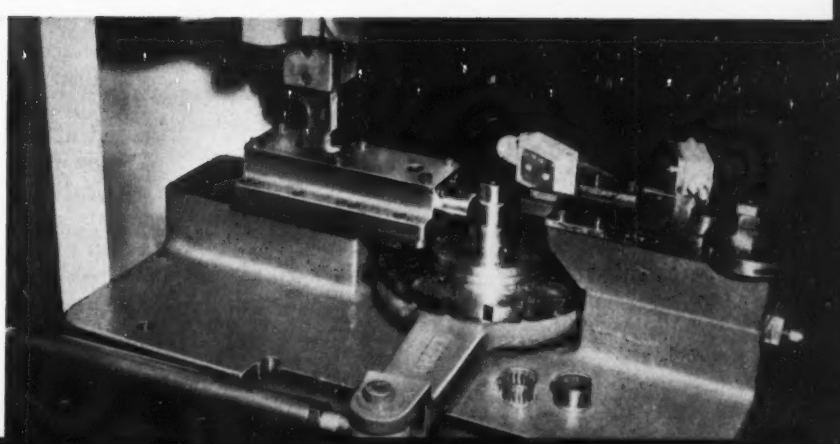
A 38-ton intermediate shaft for a giant hydro-electric plant is shown here being removed from a vertical boring machine at the Bethlehem, Pa., plant of the Bethlehem Steel Co. The hydro-electric plant in which this shaft is to be employed will be located at the $280,000,000 McNary Dam on the Columbia River. This dam will make a substantial contribution toward vital Pacific Northwest power by operating fourteen generators with a total capacity of nearly a million kilowatts.



An exceptionally tough problem of rough-turning cast-iron corn husker rolls has been solved by using Kennametal K-6 clamped-on-tip cemented tungsten-carbide tools on a 10-H.P. lathe. The husker rolls contain many hard spots and sandy inclusions and have numerous grooves on their long slender bodies which present unusually severe interrupted cutting conditions. Despite the difficult operating conditions, the Kennametal tools turn out 350 pieces before any regrinding is required, representing 115 times greater tool life than was possible with tools previously employed. The turning time per roll has also been reduced from thirty-nine to fifteen minutes.



Piercing the cage of needle bearings on an 18-ton power press with a fixture of unusual design built by V & O Press Co., Division of Emhart Mfg. Co., Hudson, N. Y. This press, operating at a speed of 100 strokes a minute, pierces nineteen rectangular shaped holes, 7/64 inch wide by 5/8 inch long, in bronze tubing 0.025 inch thick. The punches operate in a horizontal direction. The tubing blank is placed over a die, where it is automatically pierced and indexed for the successive slots. When the required piercings are completed, the machine stops automatically.



Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

High-Density Metal for Static and Dynamic Balancing

The marketing of a high-density non-cutting metal has been announced by the Metal Carbides Corporation, 107 E. Indianola Ave., Youngstown, Ohio. Comprised chiefly of tungsten, it has a specific gravity 50 per cent greater than lead, and is readily machined with carbide-tipped tools.

This material, available in various sizes up to 25 inches in diameter and 40 inches long, is being used to screen out radioactive rays. Because of its high specific gravity, the metal is suitable for correcting static and dynamic unbalance, as well as other applications requiring maximum weight in minimum space.

Hard-Facing Alloy Applied by Arc-Welding Process

Resistance to abrasion at high temperatures, the ability to withstand attack by molten copper, and improved welding characteristics are some of the advantages offered by CM-199, a hard-facing alloy manufactured by Coast Metals, Inc., Little Ferry, N. J. Because of its ability to resist abrasion at high temperatures, it has found successful application as a hard facing for large guide rolls, hot friction guides, and soaking tong bits. It has also been used to provide protection for the lips of copper converters.

The hard-facing alloy can be applied to itself and to most ferrous materials by arc-welding to produce a non-porous and crackfree deposit.

Process for Oxide Removal from Copper Alloys

A process for the removal of cuprous oxide coatings found on the surfaces of copper alloys has been made available by Enthone, Inc., (Department M), 442 Elm St., New Haven 11, Conn. Ebonol "C"—as the treatment is called—converts the cuprous oxide to cupric oxide without attacking the base metal. The cupric oxide is then readily removed by the use of dilute solutions of sulphuric acid or sodium cyanide. The process has been found applicable to pure copper, tin-bronzes, phosphor-bronzes, brasses, and various copper alloys containing silicon and aluminum.

Greaseless Buffing and Polishing Composition Available

A buffing and polishing composition, called "Acme Greaseless Composition," is being marketed by the Hanson-Van Winkle-Munning Co., Matawan, N. J. The composition, when applied to a wheel face, adheres strongly to form a heavy fast-drying "head" which does not fly off and remains firm even in the warmest weather. It may be used on brushes and buffing wheels, giving good results in cutting, polishing, deburring, or satin finishing of all metals.

Phenolic Resin Coatings for Corrosion Resistance

Two new phenolic resin coatings for corrosion resistance have been introduced by the Ric-wiL Plastic Coating & Mfg. Corporation, 1290 Euclid Ave., Cleveland 15, Ohio. Ricwilite 1060, as the first of these coatings is called, is of the heat-hardening type. When baked at 350 to 400 degrees F., the coating hardens to form a chemically inert, insoluble, corrosion-resistant coating—hard and tough, glass-like in appearance, yet flexible and elastic. The second coating, Ricwilite 7100, is of the cold-setting type, being cured at room temperatures (60 to 80 degrees F.) by the addition of a catalyst just prior to application. It can be applied to almost all metals, concrete, wood, and plaster surfaces by brush or spray.

These resins were formulated to protect equipment against corrosive conditions by providing

a tough, impervious film which is resistant to attack by corrosive acids and alkalis, salt water, rust, and weathering. The coatings are ideal for protection of ventilating and duct systems, drill pipe, piping and equipment in food and chemical process plants, oil refineries, pulp and paper plants, tank cars, and storage tanks.

Rubber-Base Plastic Employed in Place of Copper

Kralastic is a tough, corrosion-resistant, rubber-base plastic being produced by the United States Rubber Co., Rockefeller Center, New York 20, N. Y., for use as a substitute for copper and its alloys in some applications. This plastic is unaffected by soil acids or alkalies, has good dimensional stability, and can be completely immersed in water for long periods of time without adverse effects. It is used to manufacture corrosion-resistant pipe for water systems and for handling corrosive chemicals. The plastic can also be used in the manufacture of various plumbing specialties, such as water meter components.

Quick-Drying Degreaser for Cleaning Metal Parts

A metal degreaser known as "Flo" for solvent degreasing of parts and engine and electrical accessories has been brought out by the Curran Corporation, Prospect Mills, Lawrence, Mass. This solvent is said to be relatively odorless, easy to handle, and safe for use. It dries quickly without leaving any film or sticky residue, and is non-corrosive. At present the solvent is available in 50-gallon drums.

Fast-Acting Soldering Flux Contains Tinning Agents

Fusion Electro-Tin TE-400 (a combination of organic, fast-acting fluxing agents and finely divided metal tinning agents) for use in soldering and dip tinning has been developed by Fusion Engineering, 4504 Superior Ave., Cleveland 3, Ohio. This combination of the agents makes soldering possible under difficult conditions by using non-acid, neutral materials which possess the characteristics of strongly active acid fluxes. Although originally used in the electrical industry for such operations as dip tinning of transformer leads and dip soldering of commutators, this material finds wide application in all fields of assembly where soft solders are used.

New and Improved Cutting Oils Available

Additions and improvements in its line of non-soluble cutting oils have been announced by the Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa. These oils, known as Atlantic Cutting Oils 20 through 45, do not develop offensive or rancid odors, and will not indelibly stain hands or clothing. In addition, they reduce friction, provide adequate cooling, and exhibit good anti-weld and metal wetting characteristics.

Solid Lubricant Films Applied with Brush

Tough, adherent, dry-lubricant finishes may now be applied to any machine or instrument surface, employing ordinary brushing or spraying techniques and equipment, by the use of new types of molybdenum-base lubricating enamels being offered on an experimental basis by the Lubricants Division of the Lockrey Co., Southampton, N. Y.

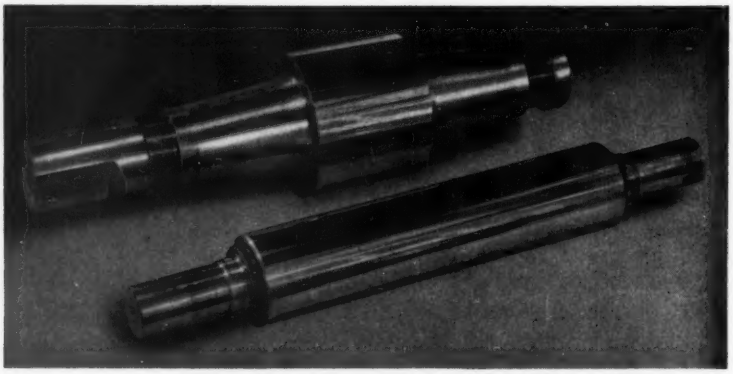
The lubricant-coating, called "Molynamel," puts a lustrous, hard, greasy-feeling but clean coating, from 0.20 to 0.0005 inch thick, on any type of surface, over practically any kind of material, including plastics, glass, and ceramics. It is effective on porous surfaces, since it fills the pores and provides a feeding supply of lubricant. Probably its most effective use will be in instruments such as optical and electronic apparatus. With instruments of this type, liquids containing volatiles cannot be employed due to the possibilities of freezing and contamination or clouding of optics, nor can dry powders be used due to difficulties of application and lack of adhesion.

Other likely uses would be on tables of band saws, drilling machines, etc., and on chutes or work-tables where heavy weights must be moved around by hand, and where oil cannot be used due to the need for keeping the surface clean.

Detergent for Cleaning Aluminum and Magnesium

Rapid cleaning of aluminum, anodized aluminum, and magnesium parts in power washing equipment is possible by using a detergent called Kelite PWB No. 81 made by Kelite Products, Inc., 1250 N. Main St., Los Angeles 12, Calif. The detergent is a water-soluble powder which removes virtually all types of soil, including manufacturers' ink markings, in approximately one minute. It is non-foaming and non-corrosive, has stability, and exhibits long life.

Superfinishing of Mill Rolls Lengthens Their Life



A ROLLING mill that produces stainless-steel strip stock recently made some tests in an effort to extend the working life of mill rolls and reduce the time and expense of refinishing the rolls. Test rolls were shipped to the Gisholt Machine Co., Madison, Wis., to be Superfinished. When the rolls were returned to the mill and placed in production, it was found that one set of Superfinished rolls ran thirty-six machine-hours, in contrast to less than eight hours for a similar set of ground rolls.

In another test, it was found that Superfinished rolls would handle 280,000 pounds of stock before refinishing was required, compared to less than 100,000 pounds with ground rolls. Also, in a salt spray test, it was shown that there were less iron inclusions in the stainless-steel rolled strip when the mill roll had been Superfinished. Based on these tests, a mill-roll Superfinisher was ordered, and is now in use in the plant. The machine has a completely automatic cycle and is adjustable to handle a wide variety of mill rolls (such as the ones shown in the heading illustration) up to 20 inches in diameter with a 36-inch roll working surface. Rolls with a single or a double crown measuring from 0.001 to 0.007 inch are also handled on this machine.

The cycle starts with the operator loading the roll into the machine. The roll is supported by a tailstock and rests on its own bearings, Fig. 1. As the roll is driven with a special adapter, the Superfinishing stones contact the work and are oscillated and traversed back and forth over the length of the roll. Three automatic changes of spindle speeds provide roughing, semi-finishing, and finishing operations. The spindle brake is applied at the completion of the cycle, and the roll is wrapped to protect the Superfinished surface and then removed from the machine.

Additional tests are now being carried on at the mill. The complete Superfinishing operation is taking a maximum of fifteen minutes, depending on the size of the roll. Tests using various vitrified-bonded abrasive stones have produced a surface roughness of 1 micro-inch r.m.s. or less. Each of the four Superfinishing heads carries a quick-change stone-holder, and each stone is dressed to the work radius to provide an area rather than a line contact. The life of Superfinished rolls has generally been found to be three times that of ground rolls.

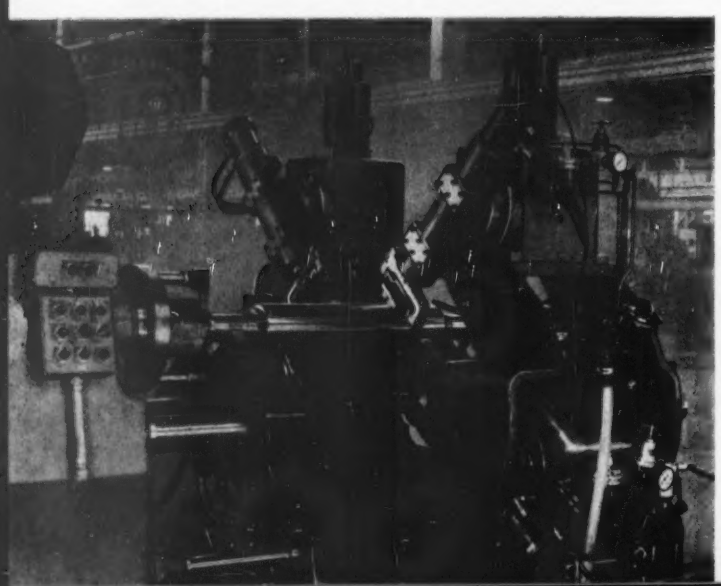


Fig. 1. Close-up view of mill-roll Superfinishing machine showing four heads, a bearing support, and the driving adapter. Stones oscillate and traverse to scrub away amorphous metal.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Lathe Chuck Useful in Holding Non-Cylindrical Round Work

By W. M. HALLIDAY, Birkdale, Southport, England

An effective type of universal lathe chuck for holding short tapered parts—for example, tapered dowel pins or short non-cylindrical (but symmetrical) round parts such as machine handles—is here illustrated. Operations like end facing and end drilling can be readily performed, with the advantage that the chuck is immediately and automatically adjustable to any degree of taper or variety of contour of any object within its capacity. With work of this nature held in a conventional chuck, it is necessary to use a set of soft jaws or an intermediate split bushing, either of which must first be bored to correspond to the contour of the work. What is more, the soft jaws or split bushing must be rebored for each application.

In the half-sectional view of the chuck, Fig. 1, are shown construction details. One end of its steel body is reduced to form the shank *A* that conforms to the taper of the spindle hole of the lathe. A tapped hole *B* receives a draw-in bar that maintains the chuck in position. The body of the chuck is bored out at *C* to a diameter that is great enough to receive the size of objects for which the device is intended.

Three slots *D* are milled radially into the body, spaced 120 degrees apart. Within each slot is a pair of hardened steel arms *E*. These are pivoted on a fulcrum pin *F* pressed in a hole cross-drilled through the sides of the slot. The arms in each pair are stepped down to half thickness in the area of the pin so that they are in line. The longer part of each arm is within the bore *C*, with its extremity rounded to form a gripping point *G*. The shorter and upper part of the two arms *E* bears against the clamping nuts *H* engaging the exterior of the body, which is threaded. It will be noted that the upper edges of the arms are cambered for smooth action against the faces of the nuts.

For ease in manually adjusting the nuts, their periphery is knurled. Each nut also has several small holes *J* drilled radially to receive a spanner wrench used in applying locking pressure when a work-piece is being gripped. All three pairs of arms must be made exactly the same shape and size. A good way to attain the neces-

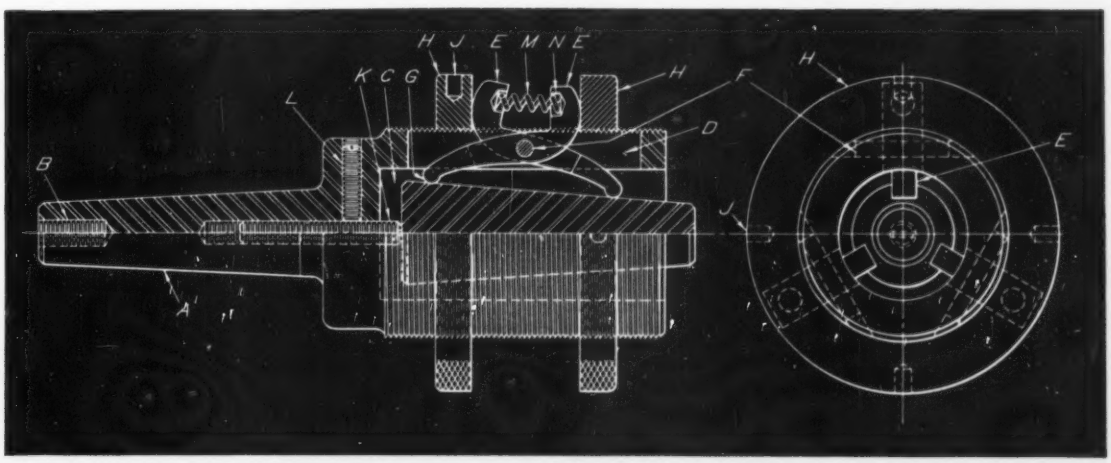


Fig. 1. The tapered object in the chuck is automatically centralized and gripped when the three pairs of arms (E) move radially in unison.

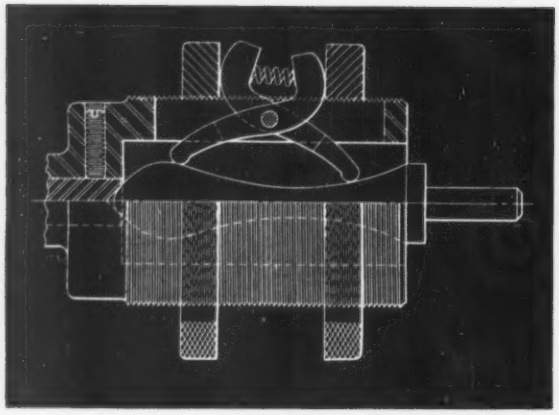


Fig. 2. The arms adjust themselves with equal facility to a non-cylindrical, but symmetrical, round object such as this machine handle.

sary precision is to machine a bar (of sufficient length to make all six arms) to the required outline shape, and to drill the bar for the fulcrum pin-hole. The bar can then be sawed to produce six arms of the proper thickness. These require stepping to half thickness on one side in the area around the fulcrum pin hole.

In many applications, the over-all length of the object is critical. For this purpose, a threaded stop-rod *K* can be extended a suitable distance into the bore *C*. A set-screw *L* maintains the setting of the stop-rod. When positioning an object, its rear face is held firmly against the stop-rod before any locking pressure is applied.

Between the upper parts of each pair of arms is a light compression spring *M*, both ends of which are contained in shallow blind holes *N*. The purpose of this spring is to spread the arms apart when the nuts *H* are released, thereby facilitating unloading and reloading.

After an object has been positioned against the stop-rod, both nuts are screwed toward each other until they are hand-tight, then each is locked with the spanner wrench. In tightening, the lower parts of the arms converge toward the center line of the chuck, and since the three pairs of arms move in unison, the object is automatically centralized.

The larger diameter of the object which the chuck holds in Fig. 1 is toward the back of the body. However, the object can be reversed in the chuck, and the arms will automatically readjust themselves. Fig. 2 shows how conveniently a machine handle was held in the chuck when it was necessary to recut the cylindrical shank at one end. It will be noted that the stop-rod was given a conical seat to provide a suitable endwise location for the handle.

Grinding Fixture for Holding Work at Any Angle

By JOSE SOBKOWIAK, Jackson, Mich.

Work-pieces can be held at any required angle by means of the grinding fixture shown in Fig. 1. The fixture, which can be mounted on a magnetic chuck or clamped to the table of a surface grinding machine, is simple to construct and use, but rugged and accurate.

The T-shaped body *A* of the fixture can be made from a well-seasoned piece of close-grained cast iron, drilled to provide three horizontal rows of five equally spaced holes each. Three

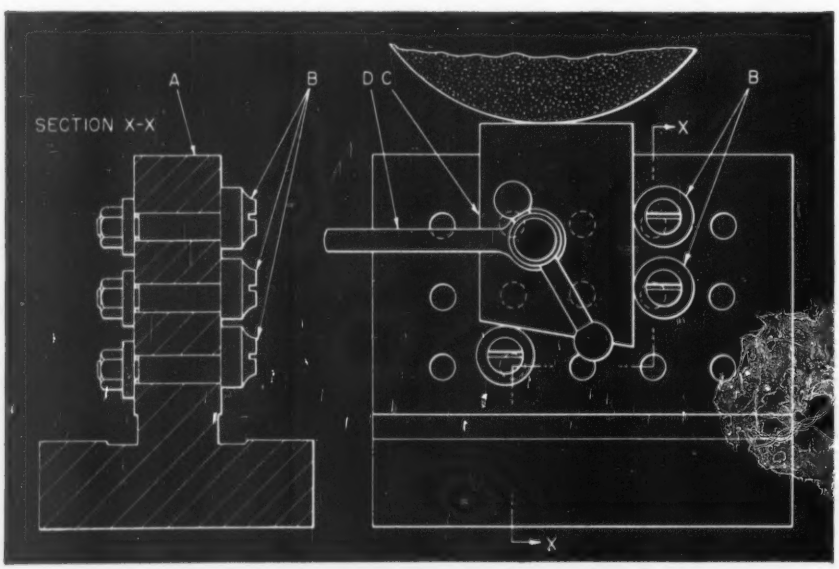


Fig. 1. Versatile grinding fixture in which work-piece (C) is held on and against three adjustable screws (B). Clamp (D) holds the work against the face of fixture body (A).

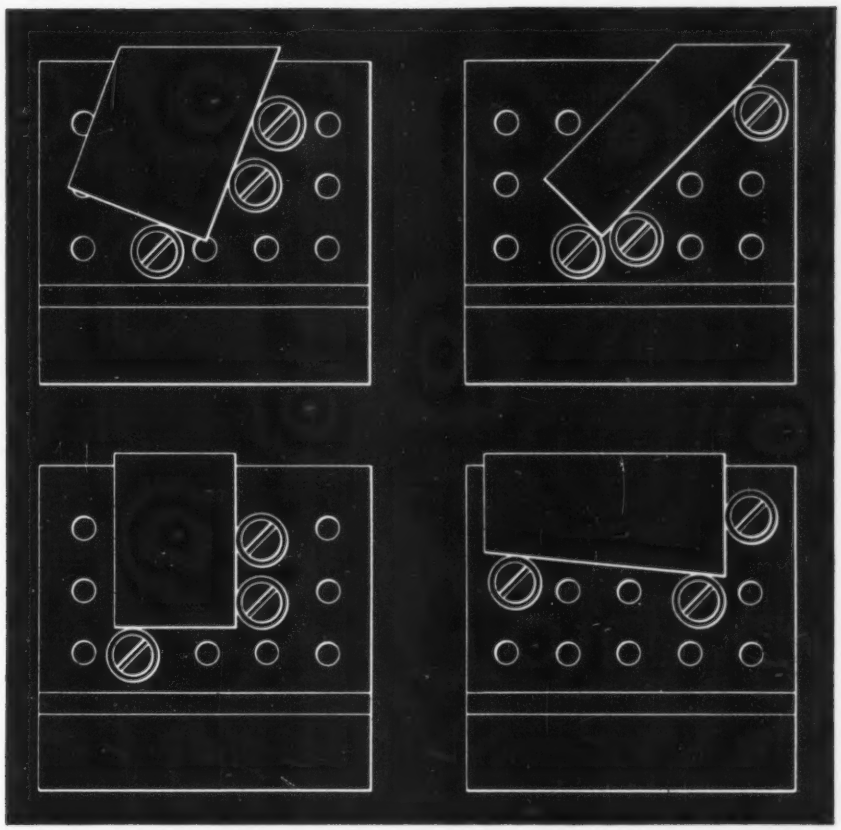


Fig. 2. Four of the many set-ups possible on the versatile grinding fixture shown in Fig. 1. By inserting the screws in the proper holes and adjusting their eccentric heads, work-pieces having various angular surfaces can be accommodated.

screws *B*, having eccentric work-holding heads, are held in the body by washers and nuts.

By inserting the screws in the proper holes and tightening them when their eccentric heads have been rotated to the required positions, the work-piece *C* can be held at the necessary angle. Square and vernier protractors can be used to determine the location and adjustment of the screws for various angles. Once the screws have been set, any number of identical pieces can be ground without altering the set-up or removing the fixture from the machine.

A clamp *D* can be used to hold the work against one face of the fixture body. Fig. 2 shows four of the many set-ups possible with this versatile fixture. Slight variations in the spacing of the holes will not affect the accuracy of the fixture, since such discrepancies can be compensated for by proper setting of the screws.

Special Jig with Standard Base

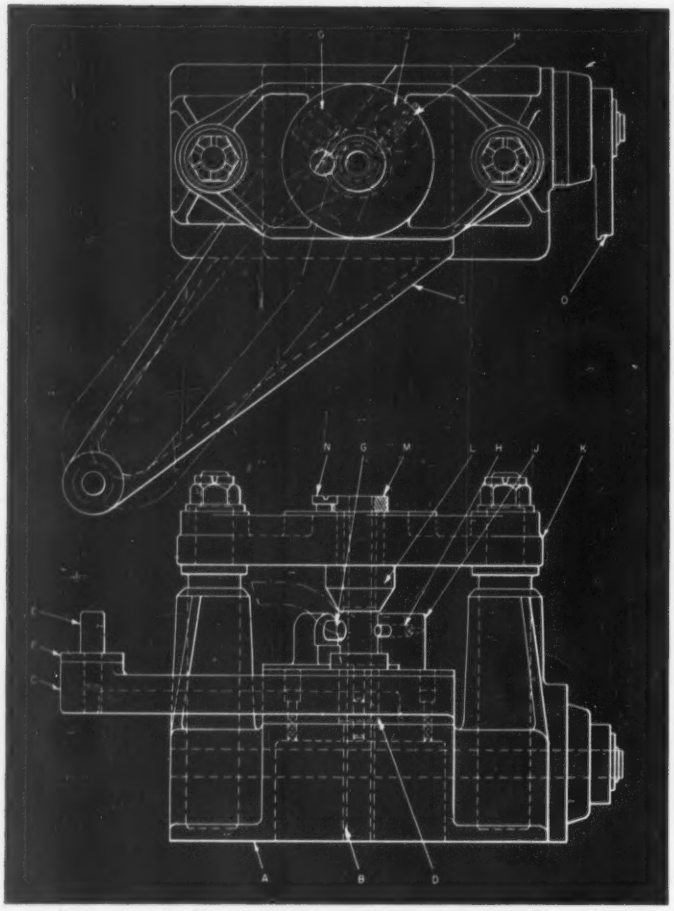
By ROBERT MAWSON

In designing jigs and fixtures, it is advantageous to make use of standard fixture parts whenever possible, since time is saved when special patterns and castings are not required. For example, the special drilling and reaming jig seen in the illustration on the following page was made by modifying a standard fixture. The jig is used to drill and then ream a hole through one of the two bosses on both left- and right-hand links for a machine made by the Wildman Mfg. Co., Norristown, Pa.

The standard fixture *A* was modified by driving a tube *B* into a hole in its base. The bore of the tube clears the drill and the reamer, and serves as an exit for chips. A locating plate *C* is secured to the top machined surface of the fixture base, and a shouldered rest bushing *D* for the work-piece is accurately located in this plate. The bushing bore also clears the cutting tools.

Pressed into the projecting end of the locating plate is a pin *E*, the periphery of which has been ground to provide a sliding fit in the hole previously reamed through one boss of the work-piece. Under the head of this pin and resting on the plate is a work-supporting washer *F*, the upper surface of the washer being in alignment with the top surface of bushing *D*.

Stop-pin *G*, the head of which is provided with a double 15-degree beveled surface for contacting one boss on the work-piece, is held in a boss projecting upward from the locating plate *C*. A



Special jig employed for drilling and reaming a hole through the bosses of left- and right-hand links is made from a standard fixture (A)

spring-loaded positioning pin *H* is mounted in a vertical post *J* that is held in the locating plates. A work-clamping bushing *L* is pressed into the under side of the upper, movable plate *K* on the standard fixture. The lower end of this bushing is chamfered to clear the work-piece. Slip drill bushing *M*, which is prevented from rotating by a shouldered head screw *N*, fits into the bore of the work-clamping bushing. Bushing *M* is replaced by a slip reamer bushing after completing the drilling operation on the work-piece.

In operation, movable plate *K* is raised by lifting hand-lever *O*. The work-piece to be machined is placed in the jig, being accurately located by pins *E*, *G*, and *H*. When plate *K* is lowered, the work is securely clamped by bushing *L*.

* * *

Capacity to produce primary aluminum rose by 100,000 tons, or 10 per cent, in the first six months of 1952.

Surface Cleaning Techniques and Materials

Selection of proper surface cleaning techniques and materials requires careful consideration. It depends, according to an article recently published in *Technical Aids for Small Business*, on such factors as understanding the true nature of the contamination; the metallurgical characteristics of the contaminated surfaces; shape, size, and weight of the work-pieces; the cleaning equipment on hand; permissible cost of operation; strength of adherence of the impurities to the surfaces; final surface finish to be attained after mechanical or chemical precleaning, and whether it is to be accomplished by tumbling, sanding, polishing, or by electroplating; past experience of the shops; and readiness of management to accept some of the useful information now available on surface cleaning techniques and materials.

For instance, a cleaning compound suitable for an oily, smooth surface is not at all satisfactory to clean and descale the rough surfaces of a forged work-piece. Or, a technique which is applied to clean surfaces prior to certain precision machining operations is not adequate for cleaning the same surfaces for the purpose of final inspection.

Again, the removal of various oils used on dies as drawing compounds, or as coolants or lubricants in machining operations, requires quite different precleaning techniques from those used to remove various oxide or carbon deposits. The inherent metallurgical characteristics of each metal must, to do a good job, be considered fully.

If the above factors are taken into consideration, then not only will inefficient, expensive, and unsafe surface conditioning techniques be avoided, but also conservation in manpower and material will result. Since the material in the work-piece is the dominant factor which determines these techniques, all selections should start from that point.

* * *

Powder metallurgy methods employed by the Moraine Products Division of General Motors to make gears save approximately 64 per cent of the material that would be scrap under conventional machining methods.

INGENIOUS *Mechanisms*

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

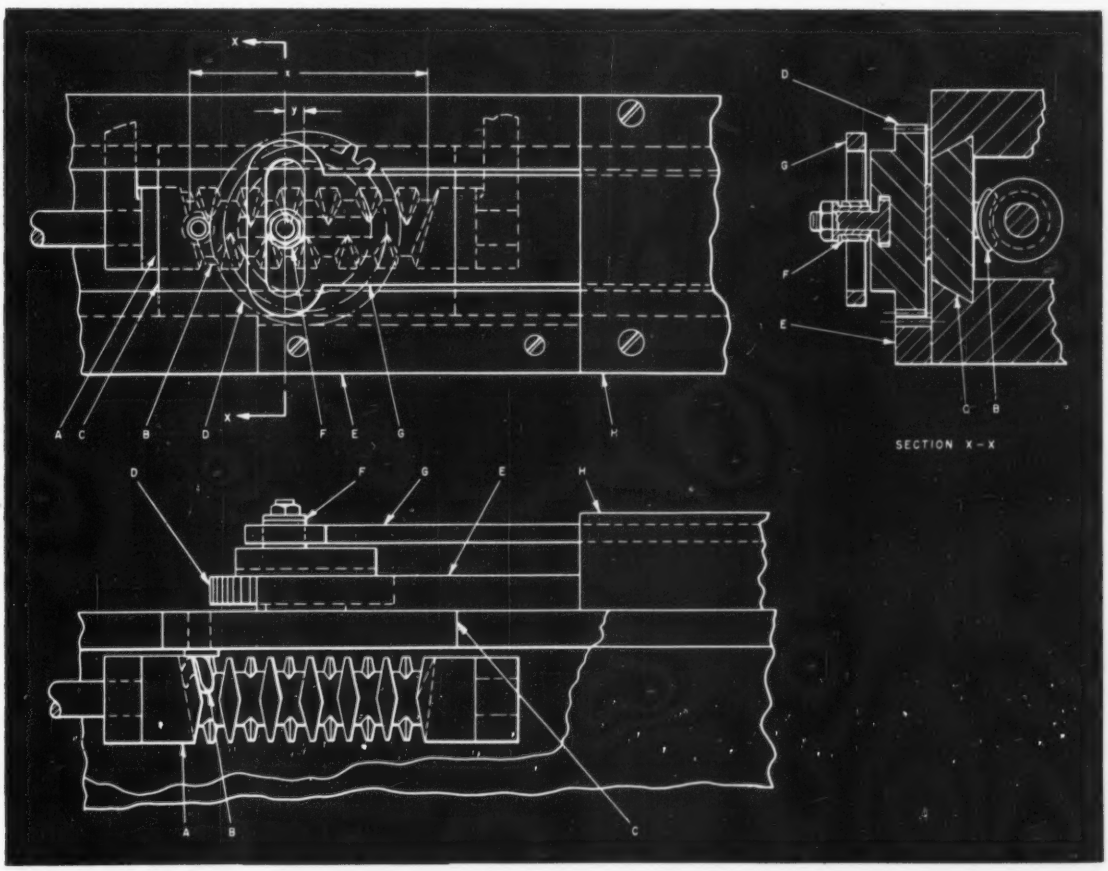
Fixed Stroke Converted into Variable Stroke

By L. KASPER

The demand for varying widths of a flat wire product where previously only one standard width was processed made it necessary to provide existing machines with a simple mechanism to insure even winding onto spools. Even winding was accomplished without modifying the width of the spools by providing an adjustment for the stroke of the guiding member.

As can be noted in the accompanying drawing, when double screw *A* is rotated by its shaft, it transmits reciprocating motion to the slide *C* through the forked, swinging follower *B*. This portion of the assembly is part of the original mechanism, and transmits motion to slide *C* equal to the length of screw *A*, as indicated by dimension *x*.

To provide for adjustment in the length of travel, a few modifications had to be made. A rack-and-pinion and "Scotch yoke" arrangement was devised which consisted of a gear, rack, roller, slide-bar, and support block. Investiga-



This mechanism, which originally consisted of a double screw and slide arrangement to give a fixed stroke, was modified by the addition of a rack-and-pinion and a "Scotch yoke" to provide an adjustable stroke.

tion of the mechanism reveals that gear *D* rotates freely on a stud in slide *C* and meshes with rack *E* which is attached to a stationary part of the machine. Any linear movement of slide *C* produces rotation of gear *D*, the pitch diameter of the gear *D* being such that it will be given a complete half-revolution as the slide *C* covers its range of travel. The hub of gear *D* has a T-slot containing a T-bolt on which roller *F* rotates freely.

Movement of the T-bolt in the T-slot permits adjustment of the position of roller *F* relative to the center of rotation of gear *D*. Roller *F* engages a slot in slide-bar *G* which, in turn, is supported in block *H*. To the opposite end of bar *G* is fastened the guide which delivers the product to the spools. In the original mechanism, the guide was fastened to the end of slide *C*.

The center of roller *F* is offset from the center of rotation of gear *D*, a distance *y*. As gear *D* rotates, the center of roller *F* describes a semicircle, with radius *y*, about the center of gear *D*. Roller *F* acts in the slot of slide *G*, and a half-revolution of gear *D* advances this slot to the opposite side of the center of gear *D*. The relative movement of the bar to the gear is equal to a distance 2 *y*. Since the center of gear *D* moves through a distance *x* due to the linear movement of slide *C*, the combination of the two movements results in a total length of travel of slide *G* equal to *x* plus 2*y*.

If the roller *F* were placed on the opposite side of the center of gear *D*, with the slide *C* in the position shown, the total movement of slide *G* would equal *x* minus 2*y*. Furthermore, if roller *F* were placed exactly over the center of gear *D*, roller *F* would merely rotate on its center, and the total movement of slide *G* would be the same as that of slide *C*.

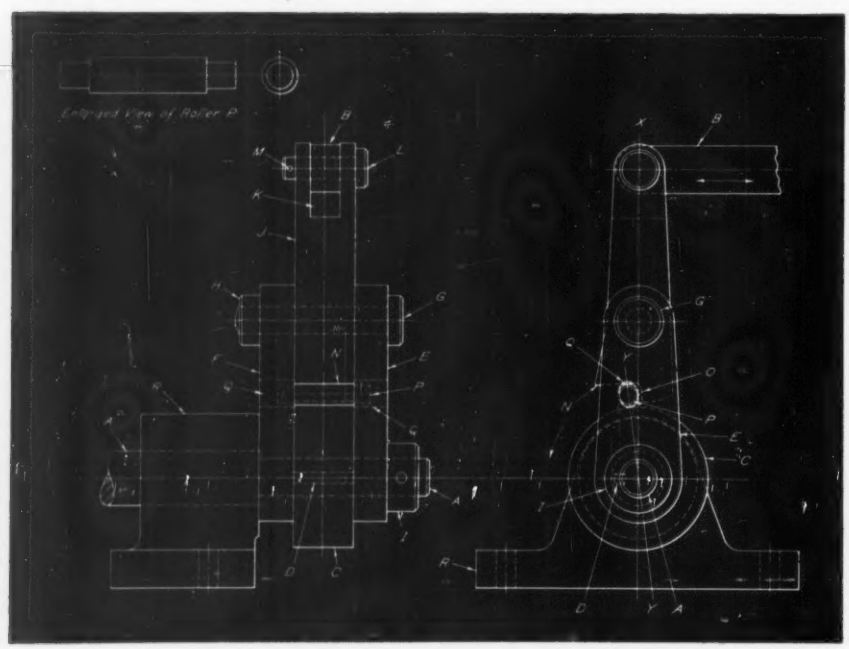
With roller *F* displaced to either side of and rotating about the center of gear *D*, the motion it imparts to slide *G* is harmonic. This motion is superimposed on the linear motion produced by slide *C* on slide *G*. The harmonic motion is so slight, however, as compared with the total movement, that it is not objectionable in the winding of the wire product onto the spools.

Roller and Disc Type Ratchet Mechanism

By W. M. HALLIDAY

A gearless ratchet mechanism which possesses practical advantages over the conventional ratchet gear and spring-loaded pawl mechanism is here illustrated. The device was required to impart an intermittent drive to a shaft, its own movement being derived from a constantly reciprocating connecting-rod. The drive had to be transmitted without lost motion or noise.

Shaft *A* is the driven member which must be moved intermittently in a counter-clockwise direction. Connecting-rod *B* is reciprocated by means of a conventional crank mechanism having a radially adjustable crank-pin, whereby the length of the connecting-rod stroke may be varied to suit the required motion of shaft *A*.



Roller and disc mechanism designed to impart an intermittent rotary movement to a shaft

Hardened and ground cast-steel disc *C* is keyed to shaft *A*. The periphery of the disc is of critical importance, and should be ground concentric with the bored hole.

Two identical steel links *E* and *F* are bored at their lower ends to be a free running fit on shaft *A*. At the upper end, each link is bored parallel with the lower hole, to receive the long shank of the fulcrum stud *G*. Collar *H* is secured to the projecting end of the shank at the rear, and prevents endwise movement of the fulcrum stud.

Shaft *A* projects beyond link *E* for a certain distance so that collar *I* may be keyed or pinned to the shaft in order to hold the links and disc in the proper lateral position. Mounted to swivel freely on the shank of fulcrum stud *G*, between the links, is a cast-steel lever *J*. The sides of this lever are ground parallel with each other to give a lever thickness approximately 0.004 inch less than the thickness of disc *C* which determines the spacing of links *E* and *F*.

At the top end of lever *J* is a milled slot *K* which receives the end of connecting-rod *B*. Members *B* and *J* are freely linked together by pivot pin *L* which passes through a hole machined parallel with the axis of shaft *A*. A small pin *M* acts as the retainer for the pivot pin against endwise movement.

The lower end of lever *J* has a flat surface at *N* which is inclined at an angle of about 93 degrees from the vertical center axis of the lever. Where this flat terminates, a step *O* is formed. The lower tip of the lever is formed to a radius from the center of fulcrum stud *G*. The height of step *O* is carefully determined so that the rounded end of lever *J* will clear the periphery of disc *C*. This end of the lever should be hardened and the surface of the flat made parallel with respect to the rim of disc *C* in the crosswise direction. The flat surface should also be polished.

Between flat *N* and the periphery of the disc *C* is a hardened and ground nickel-chromium steel roller *P*, machined as shown in the upper left-hand corner of the illustration. The purpose of the two shoulders is to maintain the roller in the correct working position between links *E* and *F*. Each reduced diameter of the roller provides a sliding fit within an elongated slot *Q* in links *E* and *F*. The two slots should be the same size and exactly in line with each other in all planes. Their length should be sufficient to allow the roller about 1/8 inch movement in a direction indicated by the inclined line *Y–Y*, which is 7 degrees from the perpendicular line *X*.

The middle portion of roller *P* is about 0.005 inch shorter than the width of disc *C*, so that the reduced portions of the roller will be free to rotate. The diameter of the middle portion of roller *P* should be not less than half the diameter of driven shaft *A*. It will then be able to resist heavy pressures arising during its operation.

When lever *J* occupies the position shown at the right—that is with its center axis coinciding with the perpendicular line *X* of the mechanism—the distance between flat *N* and the rim of disc *C* at the narrowest point should be appreciably less than the maximum diameter of roller *P*. For this reason, flat *N* and the roller must be carefully designed so that they will make contact with each other, and the roller must be in contact with the rim of disc *C* when the roller lies on the inclined axis *Y–Y*. The flat will be tangent to the side of the roller about the intersection of axis *Y–Y*, as shown.

With the roller thus situated in the working position, as seen at the right, a small clearance space must be provided between that member and step *O* to allow for the release of the roller. A clearance of about one-quarter the diameter of the roller will be found adequate for most general purposes.

In operation, connecting-rod *B* is moved toward the left so that lever *J* swivels slightly about fulcrum stud *G*, in a counter-clockwise direction, causing flat *N* to bear on roller *P*, which, in turn, becomes wedged against the rim of disc *C*. This wedging action multiplies the lateral thrust imposed by rod *B* to provide a gripping pressure between the lever, roller, and disc. Thus, all the members of the mechanism are locked together so that links *E* and *F*, and disc *C* with its shaft will move in unison with lever *J*.

When the end of the forward stroke is reached, and rod *B* commences to move in the reverse direction, lever *J* will again be swiveled about fulcrum stud *G* a slight amount, in the clockwise direction. The amount of swivel will be controlled by the degree of clearance between the roller and step *O*. This action releases the roller, and permits slippage between the roller and disc. As a result, during the reverse movement of the connecting-rod, shaft *A* and disc *C* will remain stationary. Elongated slots *Q* in links *E* and *F* facilitate the release of the roller, but they will hold it in the working position ready for the next forward movement of the connecting-rod.

* * *

Close Tolerances Held in Making Locks

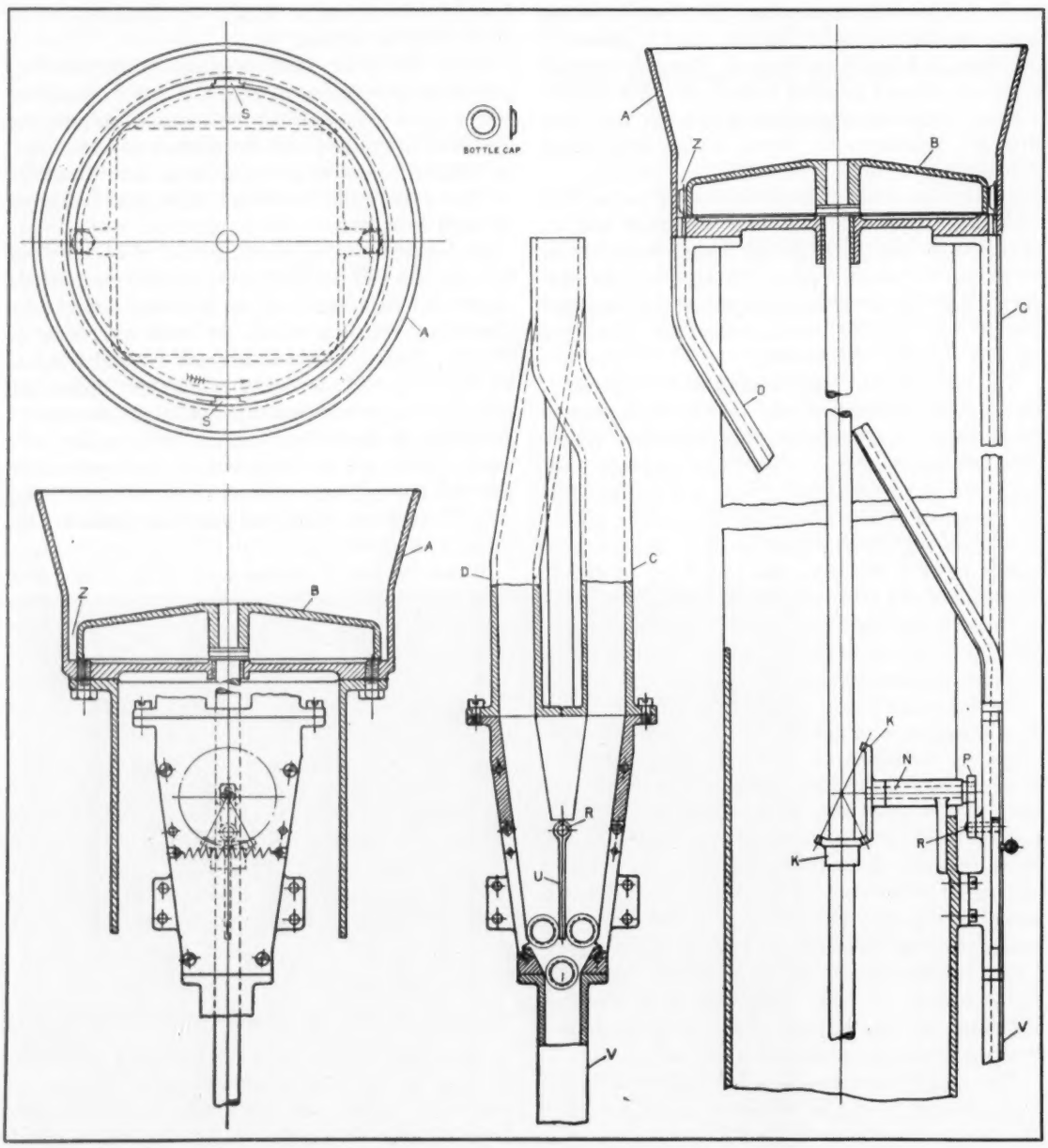
Automobile door locks are precisely made, according to the Rochester Products Division of General Motors. In the cylinder casting, less than 2 inches long, are 175 dimensions, of which 165 are held to plus or minus 0.0015 inch.

Hopper Feeds for Bottle Caps

Fourth of six articles describing mechanisms that automatically feed bottle caps from a hopper to production machines

By JOSEPH and VINCENT WAITKUS

THE "double-escape rectifying hopper" shown in the illustration, for use in feeding bottle caps to production machines, is much the same as the "quarter-turn chute rectifying hopper" described in February MACHINERY, page 184, with the main exception that the quarter-turn



Hopper feed with "double-escape" slots for automatic feeding of bottle caps

chute has been replaced by double-escape slots *S* in the housing *A*.

Each slot *S* is machined so that it will permit bottle caps to pass through into the chutes *C* and *D* only when they face one way. The result is that the caps are divided between chutes *C* and *D* according to the positions in which they drop into the slot *Z* from the rotating disc *B* in the hopper. By placing these escape slots *S* 180 degrees apart, the necessity of making a twist in one of the chutes in order to bring all the caps to the collecting chamber in one position, as was done in the case of the hopper feed described in the February number, has been eliminated.

The operation of the collecting chamber is the same as that of the quarter-turn rectifying hopper. A slight change is shown in the operating mechanism. This consists of a pair of bevel gears *K* which rotate a small eccentric plate on the end of the shaft *N*. The eccentric plate oscillates the rocker arm *P* which, in turn, oscillates the finger *U*. The rocker arm *P* and the finger *U* are both fastened to the shaft *R*. The oscillating finger allows bottle caps to drop into chute *V* alternately from chutes *C* and *D* without clogging.

Additional hopper and feeding mechanisms of outstanding design and an electrical circuit developed to stop the feed when it becomes overloaded due to clogging will be described in a succeeding installment.

* * *

American Standards Approved in 1952

Eighty-seven standards were approved by the American Standards Association, Inc., in 1952, bringing to a total of 1264 the number of American standards in effect at the present time.

Recently approved standards of particular interest to the machinery industry include: Physical Specimens of Surface Roughness and Lay; Square and Hexagon Bolts and Nuts; Accuracy of Engine and Tool-Room Lathes; Specifications for Carbon- and Alloy-Steel Nuts for Bolts for High-Pressure and High-Temperature Service; Mounting Dimensions of Lubricating and Coolant Pumps for Machine Tools; and Preferred Thicknesses for Uncoated Thin Flat Metals (under 0.250 inch).

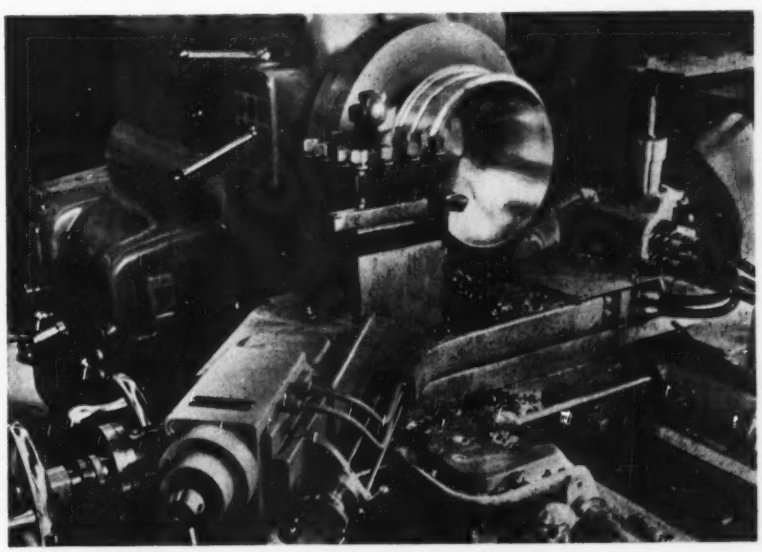
Machining Air-Tank Heads for Guided Missiles

Machining of contours on guided missile parts at the Rheem Mfg. Co., Downey, Calif., has been simplified by employing standard engine lathes equipped with Turchan followers for guiding the tools across the work. In turning the inside and outside of air-tank heads such as seen in the illustration, 23 pounds of stock must be removed from a rough forging of S A E 4130 steel. The dimensions must be held within plus 0.005 inch, minus 0.000 inch.

The inside surface of the air-tank head is cut straight near the center and then blended into a fillet having a radius of 2 3/4 inches. The fillet, in turn, is blended into a spherical surface having a radius of 8 inches. In operation, the stylus point of the Turchan hydraulic duplicator follows the template to guide the tool through the power cross-feed.

In the illustration, the equipment is being used for machining the outside surface of the part. The entire job is completed in sixty-eight minutes, as against three hours formerly required when the operation was performed by conventional methods. The ease of set-up and simplicity of tooling provided many advantages, including the use of conventional tools instead of form cutters.

No adjustments for size are necessary in changing from rough to finish cuts, as tools are set in the proper relation. Facing to length, inside boring, and machining from the inside fillet to the center of the part are all controlled by means of the template.



Taking roughing cuts on the outside of an air-tank head on a lathe equipped with a Turchan follower to facilitate machining inside and outside contours



The Sales Engineer and His Problems

By BERNARD LESTER
Management Consulting Engineer
New York

The Sales Engineer's Satisfaction with His Job

THE fact that a surprising number of sales engineers are not contented with their job relationship was discussed on my page in February MACHINERY. Now let's look into common causes of job dissatisfaction and see what we, as sales engineers, can do to help correct them.

Recently one of those parlor discussions drifted to the prevalence of strikes. "Of course," exclaimed one lady, "pay is really what comes first —pay is what everyone works for." When it was pointed out to her that repeated studies of factory workmen have revealed that, on the average, pay doesn't really come first in importance when determining job satisfaction, this lady scoffed at the idea.

Dollar pay is important. But of all the elements that compose compensation, money is far more easily evaluated and stated than other forms of compensation. It's a simple denominator—like weight read from a pointer as we step on the scale.

Emerson's essay, "Compensation," written well over a century ago, is still significant reading. It shows that compensation is much more inclusive than just dollar pay.

The light of compensation that illuminates our lives enters from four windows.

One "window" gratifies us with our interest in our work and sense of accomplishment.

A second, brightens and warms our hearts through association with friendly people.

A third, through dollar pay, satisfies our needs to a reasonable degree.

And, last, is the "light" that brings happiness to our home life.

If we fail to keep the windows clean and let them cloud up, our job will not give us true compensation.

If we do not like our work, a change is in order. Some of us hop from one job to another, often finding that the new job does not give the compensation expected. We fail to realize that a large part of job satisfaction rests with ourselves. We often fail to lose ourselves sufficiently in the captivating interests of the job and the rewards of accomplishment.

Returning to Emerson's essay on compensation, he says: "Treat men as pawns and ninepins, and you shall suffer as they. If you leave out their heart, you shall lose your own."

Emotion plays an important part in selling. The reactions of friendship are highly rewarding, but we see instances constantly where sales engineers do not get these rewards because they fail to give friendship. They do not pursue the art of friendship far enough to discover that there is hardly a human being—no matter how thick his skin, how glassy his eye, or how cold his hand—who does not finally respond to friendly contacts.

We often feel that the sales manager or the president of our company is too "tight," and argue, "I don't get enough pay." This may be true, but let's remember that in our work, dollar pay and services rendered don't go up together in one straight line. Increases in dollar pay come in jumps. Experience shows that a person usually works up into the position of earning more before the pay jump comes.

With our present tax system, net dollar reward becomes less enticing as we get into the upper brackets and other factors predominate. The compensating factors then become pride in our accomplishment and a sense of achievement at having "arrived."

Last of all, our job relationship must contribute to our home life and vice versa. Repeatedly we see instances where sales engineers

have too small a "base," because they are not active or interested in a particular community or some church, social, cultural, or economic group. The excuse is usually "We don't have time—that will have to come later." Later never comes. Don't forget that when one is looking for a man to undertake some work of this sort, the best man is found among those who are busiest.

To get more contentment and satisfaction from our job relationship, it helps each one of us to picture clearly every element of reward—every component of compensation. Then consider ourselves. How well do *we* contribute to job satisfaction?

* * *

Moving Picture on Internal Grinding

A 16-millimeter sound-color film on the principles of internal grinding is now available from the Bryant Chucking Grinder Co., Springfield, Vt. This film, called "Alignment for Better Internal Grinding" presents new information, showing examples of work finished on automatic, semi-automatic, and tool-room machines to extremely close tolerances. As such tolerances can only be maintained on properly aligned machines, great care is taken to explain in detail the correct relationship of the elements required for this type of work. The film, which runs for thirty minutes, is primarily designed for supervisory and management personnel.

Lapping Small External and Internal Splines

External splines that are of insufficient depth to allow a continuous rolling contact with a lap on conventional machines can be lapped on a production basis by a new method developed by the Michigan Tool Co., Detroit, Mich. The process is also applicable to internal splines so small that it would be impractical to make a lap that would roll with the splines. The new method can be used on Models 996 and 998 internal gear lappers built by the company.

For lapping external splines, the work is inserted in the collet chuck of the machine and an internal-tooth lap having the same number of teeth as the work is mounted in a floating holder on the reciprocating lap spindle, as illustrated in Fig. 1.

In the operation, the work drives the lap and the lap spindle reciprocates on the work center line while the work and lap rotate together. The lap spindle is braked hydraulically so as to produce a lapping action on one side of the splines. When this side of the splines has been finished, the work is revolved in the opposite direction in order to lap the other side of the splines.

For lapping internal splines, the work is mounted in the collet chuck and an external-tooth lap is mounted in the floating holder on the lap spindle, Fig. 2. Splines as small as 1 inch in pitch diameter can be finished by this method.

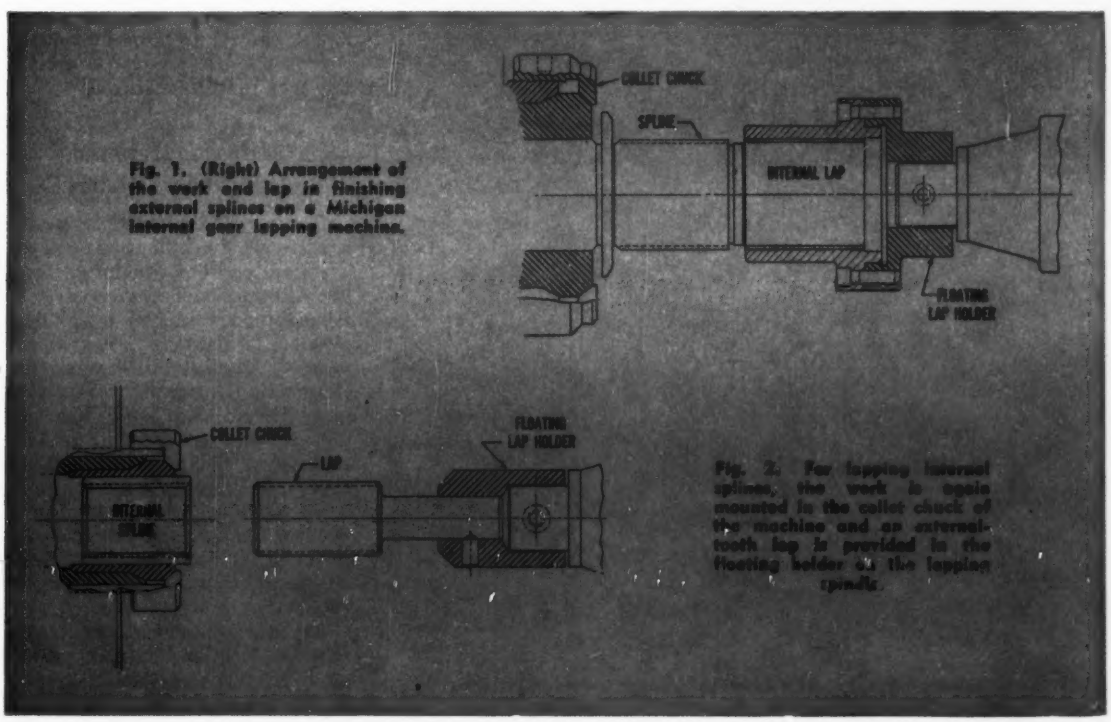


Fig. 1. (Right) Arrangement of the work and lap in finishing external splines on a Michigan internal gear lapping machine.

Fig. 2. For lapping internal splines, the work is again mounted in the collet chuck of the machine and an external-tooth lap is provided in the floating holder on the lapping spindle.

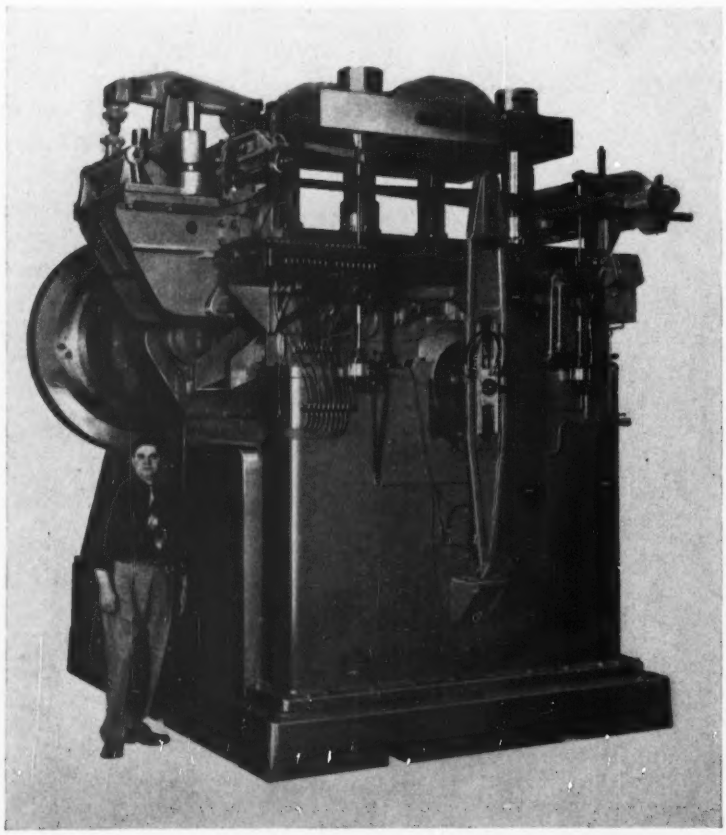
LATEST DEVELOPMENTS IN *Shop*

Henry & Wright High-Speed Automatic Dieing Machine

A high-speed 350-ton automatic dieing machine that makes completely drawn and formed stampings for an automotive part in thirteen operations by the progressive die method has been developed by Henry & Wright, Division of Emhart Mfg. Co., Windsor St., Hartford 1, Conn. The machine will handle metal stock up to 25 inches wide by 11/32 inch thick, and is said to be one of the largest of its type ever built.

In one of its first applications, pairs of right- and left-hand parts for an automotive window control gear are being made at the rate of sixty complete pairs per minute. Steps performed at each stroke of the machine include notching, piercing for pilots, drawing, and bending ears, in addition to nine other operations. The material used for these parts is 0.065-inch thick hot-rolled steel in coil form.

This large dieing machine can be equipped for producing straight shells up to 3 3/8 inches long and tapered or hemispherical shells of greater lengths. Unique construction is employed, by which any angular thrust from the crankshaft and connection linkage is absorbed by the lower cross-head instead of the punch-carrying member, as is the case in conventional overhead crankshaft presses. The cross-head is accurately guided by long ways which are rigidly keyed in the lower base. This construction insures precise alignment of the tools throughout the stroke, even under severely eccentric loading conditions. Only one operator is required for this machine.



Large-size high-speed automatic dieing machine announced by Henry & Wright, Division of Emhart Mfg. Co.

"Milford Rezistor" Band-Saw Blades

The increasing use of the newer hard-to-machine alloys has created a widespread demand for a high-speed steel band-saw blade designed to provide an economical means for cutting these tough metals. To meet this demand, the Henry G. Thompson & Son Co., New Haven 5, Conn., has announced the development of several types of red-hardness high-speed steel blades. These "Milford Rezistor" band-saw blades (patent applied for) are intended primarily for production cut-off work and are particularly effective for cutting stainless steel.

For the present, these blades will be introduced on a rental-performance basis under control of the company's engineers.

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON, Associate Editor

Cincinnati Automatic Milling Machines

A line of automatic milling machines incorporating new features developed to increase production, simplify setting up for a wide range of work, and provide for easier, more convenient operation has been announced by the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. These machines are built in plain, duplex, and plain rise-and-fall styles with spindle-driving motors of 3 or 5 H.P. Standard table travel is 24 inches, although a table travel up to 144 inches may be provided.

Automaticity and manual maneuverability have been combined to an unusual degree for production type milling machines. Through a cycle selector unit, a single lever initiates the automatic milling operation, including table cycle, spindle stop, backlash eliminator, spindle-carrier cycle of rise-and-fall machines, and spindle retraction. In setting up the machine, all these automatic features can be by-passed for manual control.

An individual motor drives the spindle through V-belts and three gear contacts, employing 3 H.P. per spindle for standard and 5 H.P. for high spindle speeds. The spindle is quill-mounted for cross adjustment. Bearings, gears, and all other parts within the spindle-carrier unit are automatically lubricated by a combination circulating and splash system.

The lever for starting the automatic operating cycle has four power manual directional control positions: rapid traverse right and left, and feed right and left. In the same unit, a second lever controls the vertical traverse of the spindle-carrier of the rise-and-fall machines. This lever has three positions—"automatic," "up," and "down" for power manual control.

The sequence of all automatic functions is controlled by the cycle selector, actually an assembly of cams on a short demountable shaft in the bed. Dogs control the length of stroke only. Cycle selectors have been designed for almost every conceivable automatic cycle. They may be changed in less than a minute's time and are interchangeable with cycle selectors for the company's No. 0-8 automatic milling machines. To further reduce the user's inventory of cycle selectors, the No. 2-24 machines are equipped with a cycle reverse device.

Automatic table cycles feed right or left, or alternately right and left with a center stop position for safety. Rapid traverse is at the rate of 300 inches a minute. Sixteen table feeds, ranging from 1/2 inch to 20 inches per minute, are obtained with change-gears. Twenty spindle speeds ranging from 30 to 1200 R.P.M. are obtained through change-gears and an externally operated back-gear.

Vertical feeds for the spindle-carrier of rise-and-fall machines are infinitely variable from 1 inch to 40 inches per minute, obtained through a dial control. Feed cycles are initiated and synchronized with the table cycles by the cycle selector unit. Adjustable stops, engaging the teeth of a fixed rack, may be set to utilize any portion of the 8-inch vertical range. The standard rise-and-fall machine

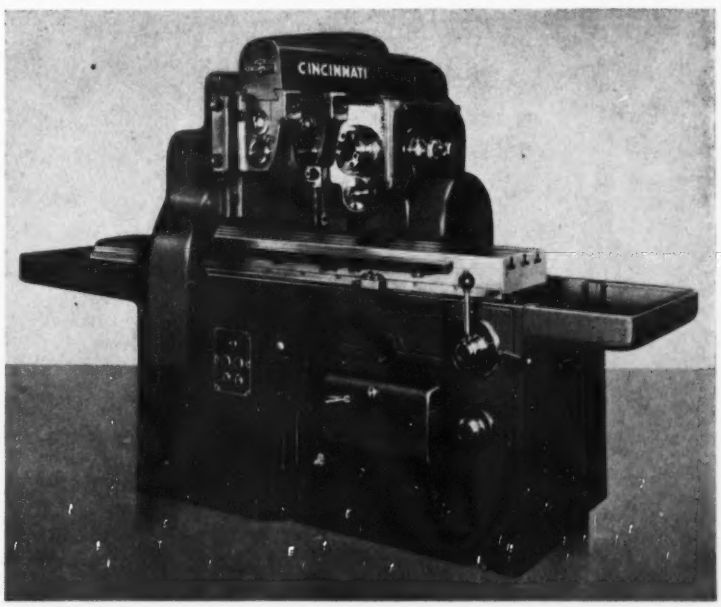
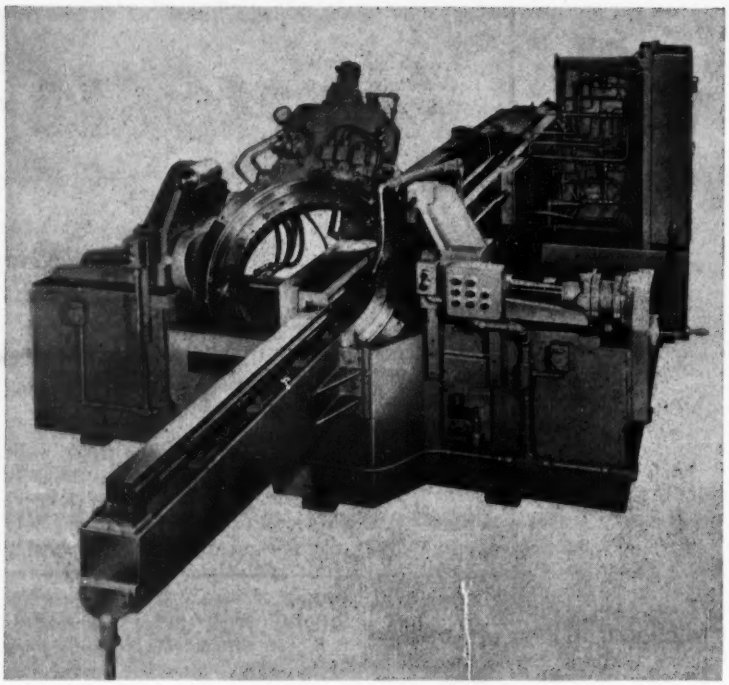


Fig. 1. Cincinnati plain automatic rise-and-fall milling machine designed to take closed end cuts and for use where retraction of the cutter is required to clean an obstruction in the work or fixture

feeds down only, and rapid traverses up and down at the rate of 100 inches per minute. However, the machine can be arranged to feed up and down for box milling.

A built-in automatic backlash eliminating device for the table feed-screw is also actuated by the cycle selector. It is engaged during the vertical feed cycle and while the table traverses at a feed rate, and automatically disengages at other times. Another built-in feature, an automatic spindle stop, safeguards the operator while loading and unloading the fixture.

Extra equipment available for Cincinnati No. 2-24 automatic milling machines includes automatic quill retraction. Just before the return stroke of the table, the spindle automatically retracts 1/32 inch. The spindle is automatically clamped in both advanced and retracted positions. Another useful extra equipment item is the cam roller "attachment." In effect, machines equipped with the latter unit are variations of the rise-and-fall style. Cams can be milled having a maximum rise of 30 degrees, and maximum drop (milling downhill) of 80 degrees. A high series of spindle speeds from 60 to 2400 R.P.M., two high series of table feeds up to 80 inches per minute, and a low series of table feeds are also available.



Machine equipped with trunnion type fixture developed by the Colonial Broach Co. for operations on jet-engine segments

Colonial Horizontal Broaching Machine

Versatility is an outstanding feature of a horizontal machine developed for the internal broaching of jet-engine segments by the Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich. This machine is equipped with a special trunnion fixture. Basically it is a standard 10-ton, 90-inch stroke horizontal broaching machine incorporating a fixture which permits an angular adjustment of 15 to 45 degrees for broaching a wide range of internal angular slots in jet-engine segments of various diameters. Compensation for variation in diameters is made by changing the internal work-support ring.

An internally mounted rotor in the trunnion fixture is actuated by an indexing mechanism mounted on top of the fixture. Thus the work-piece advances in accurate increments according to work specifications. Angular adjustment is through a worm and segment, with positive locking. The highly versatile indexing mechanism is hydraulically powered through change-gears and a Geneva motion, controlled by limit switches, and locked in place by a positive plunger.

In operation, the ring segment is mounted in the fixture, the trunnion fixture is horizontally shuttled into the broaching posi-

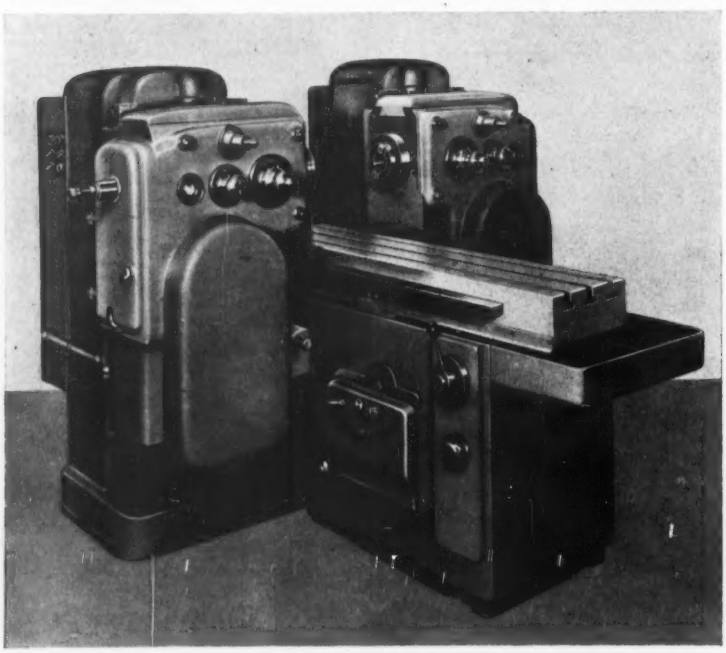
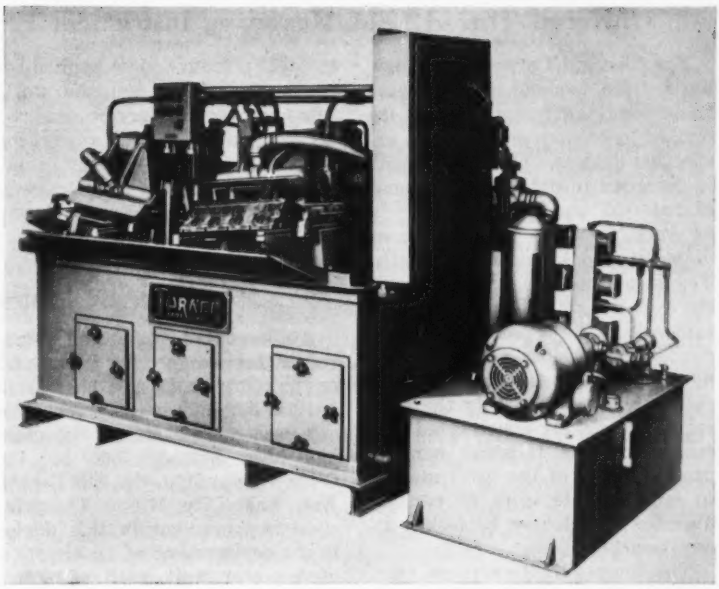


Fig. 2. Cincinnati duplex automatic milling machine in which the spindle-carriers remain fixed in relation to table traverse

tion, and the broach cuts a slot. The fixture recedes from the broach cut, the broach is returned, and the part is indexed one increment. The fixture then returns to the broaching position, and the process is repeated automatically until all the slots are broached. The rapid traverse then rotates the part automatically to the loading and unloading position, where it is ejected pneumatically. Selective electrical circuits are provided for entirely automatic operation, single indexing, or inching motions for all hydraulic units operating in either direction.

The machine is so constructed that it can be shipped in three separate sub-assemblies, and assembled in the production shop. Forced-feed lubrication supplies lubricant at each pass of the ram.



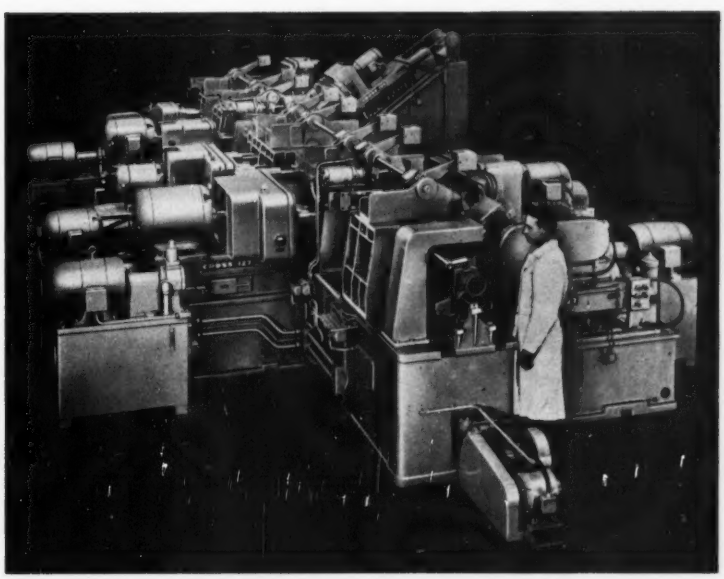
Cylinder head testing and washing machine designed by Turner Bros., Inc.

Machine for Testing and Washing Cylinder Heads

A flush-out machine for testing and washing sand and chips from semi-machined cylinder heads has been built by Turner Bros., Inc., 2625 Hilton Road, Ferndale, Mich. The cylinder head is placed in one side of the machine. When the operator presses buttons, the fixture closes, and water pressure is automatically applied to the fixture and forced into all unsealed openings in the cylinder head. A high-pressure water system is utilized, flushing through all the cylinder-head cavities for washing purposes. The water pressure is sufficient to force a 3-inch stream of water 90 feet into the air. A relatively high speed is achieved, since the operator is able to load and unload other fixtures on the machine during the testing and washing operation.

Cross "Transfer-matic" for Machining Tractor Cylinder Blocks

A special machine tool of the "Transfer-matic" type has been delivered by The Cross Company, Detroit 7, Mich., to an automotive manufacturer for use in machining tractor cylinder blocks. Like previous machines of this type, parts are automatically transferred from station to station.



Special "Transfer-matic" for machining tractor cylinder blocks built by The Cross Company

Cylinder blocks are finished at the rate of seventy-one pieces per hour on this machine. The operations include drilling, counterboring, and tapping the recess for the oil filter; drilling, counterboring, and reaming two Welsh plug holes; milling, drilling, reaming, and tapping the hydraulic pump mounting pad; and milling, chamfering, and tapping all miscellaneous holes on both sides.

The machine has thirteen stations—one for loading; one for milling; six for drilling, boring, and reaming; one for tapping; and four for inspection. Hydraulic power is employed to operate the transfer mechanism which moves the work from station to station.

Many automatic features are incorporated in the machine illustrated, including a chip remover; air-oil tap lubricating and cleansing with each cycle; gravity-operated cam clamping; and retraction for cutters during return stroke.

Universal Thread Lead Measuring Instrument

The Sheffield Corporation, Dayton 1, Ohio, has added a universal lead-measuring instrument to its line of precision gaging and inspection devices. This instrument is designed to determine the lead of internal and external threads of work parts up to 8 inches in diameter and 18 inches in length. The base supports a fixed headstock at the right-hand end and a tailstock at the opposite end. The headstock, besides providing a means for mounting the centers, carries what is virtually the barrel of a specially constructed micrometer. The tailstock can be used in either of the two runways to accommodate work of various diameters, and may be locked in any position.

The longitudinal carriage runs on balls in hardened and ground ways and supports the totally enclosed micrometer nut. A weight insures the constant application of thrust in the same direction. On the longitudinal carriage is mounted another carriage that supports the amplifying and indicating unit which has a magnification ratio of 400 to 1. The latter carriage can be traversed longitudinally and can be locked in any desired position. Provision is made for rotating the stylus holder to suit various set-ups and a spring loading device permits a suitable pressure to be applied between the stylus and the work. The micrometer screw has 40 threads per inch and a working travel of 2 inches. Any small residual lead errors which may be present can be corrected by a compensating attachment.

An attachment can be supplied for measuring the lead of taper threads up to an included taper of 1 in 4 on the diameter. The taper unit consists of a block incorporating a centrally pivoted sine bar. With this arrangement settings are made by means of an adjustable knurled screw which acts against a graduated scale.

"Di-Acro" Motor-Driven Rod Parter

An improved "Di-Acro" power rod parter designed for cutting off or "parting" rods and bars from 1/16 to 5/8 inch in diameter without producing burrs or distortion has been brought out by the O'Neil-Irwin Mfg. Co., 559 Eighth Ave., Lake City, Minn. The principal improvement in this device is the replacement of an air-operated power unit with a motor-driven flywheel. The flywheel drive—operating at 180 strokes per minute—provides six times the cutting speed previously available. The new motor driven unit can be installed in any plant where electric current is available.

An "Ejectomatic Gage," which is supplied as standard equipment with the power parter, allows the separate operations of gaging, ejecting, and cutting to be performed in a single working cycle. Materials can be cut off as fast as the operator can feed stock through the cutting heads and engage the foot clutch. Special heads for cutting square, rectangular, hexagonal, and other shaped bars can be supplied.

Sheldon Safety Drill Guide

A patented, safety drill guide for use in the aircraft and automotive industries is being marketed by the Bell Electric Co., 1844 W. 21st St., Chicago 8, Ill. This device has been developed to insure accurate and fast drilling with the added safety factor of protecting template and work from damage due to improper or careless operation of the drilling equipment. With it the worker must locate the drill perfectly in the template hole before the drill tip can make any contact. Even in the hands of the unskilled, it protects both the work and the worker.

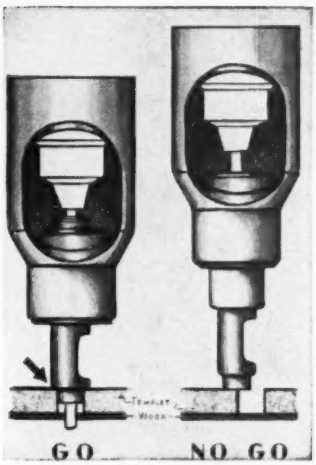
The guide has a spring-mounted



Sheffield instrument for measuring thread leads



"Di-Acro" rod parter equipped with motor-driven flywheel



Safety drill guide brought out by the Bell Electric Co.

tip with a control shoulder as shown in the illustration. The drill cannot penetrate the work until the control shoulder comes in contact with the template face. Then pressure upon the shoulder sleeve releases the concealed drill, permitting the protected drill point to advance through the guide tip and into the work.

The safety drill guide can be applied to all standard electric and pneumatic drills. In the aviation field, it is used for drill bits in sizes ranging from 3/32 to 3/16 inch in diameter.

Baldwin Universal Testing Machines

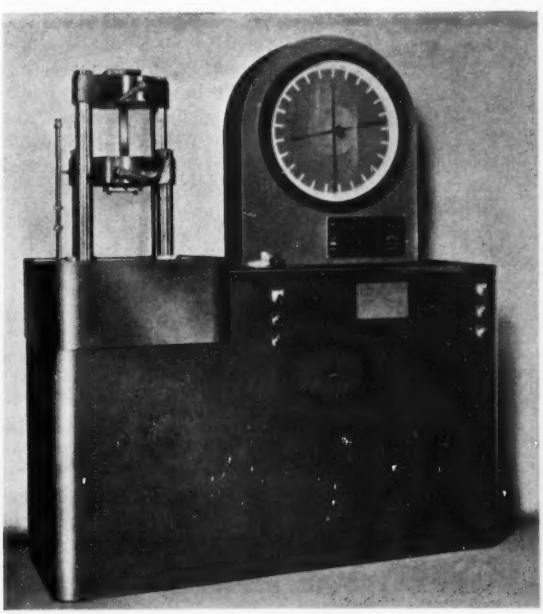
Two new testing machines have been announced by the Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa. These universal type machines, known as Models 60-H and 12-H are built in capacities of 60,000 and 12,000 pounds to provide low-cost equipment having the advantages of the larger Baldwin testing machines. The most outstanding changes incorporated in these machines are the increase in the clear space between columns from 10 to 15 inches; single-unit construction obtained without losing the advantages inherent in a two-unit design; separate framework for the gage panel to prevent the shock of breaking specimens from being transmitted to the load indicator; and provision for using either of two types of indicators, one with two precision Emery 16-inch diameter indicator dials, and the other with the more accurate Tate Emery Indicator with three ranges on a single 24-inch dial.

Both machines have rigid loading systems consisting primarily of two cages. The load (either in tension or compression) is applied upward by a movable cage, which is made up of the table of the machine and two columns supporting the upper gripping head. This cage is attached to the piston in a hydraulic cylinder in the base of the machine and has a 6-inch stroke. Loading speed can be varied infinitely between 0 and 2 inches per minute on the 60-H machine and between 0 and 4 inches per minute on the 12H machine.

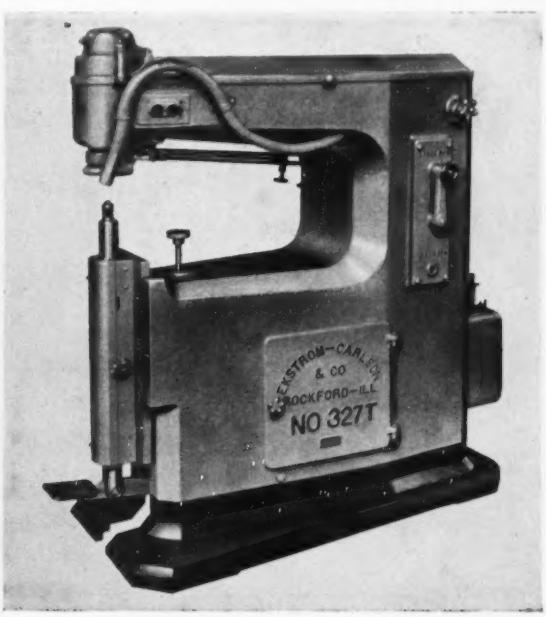
The lower gripping head can be adjusted for a speed of 10 inches per minute through a range of 17 inches by a motor drive mounted on the lower cross-head, which turns a nut on the screw by means of a worm-gear. The vertical space can be adjusted from 1 to 18 inches for both tension and compression tests. A number of accessories, including stress-strain recorders, can be used on the machines. Both machines are 67 1/2 inches wide and 27 inches deep over all and have a height of 77 1/2 inches over the indicator. The height over the loading cage is 2 1/2 to 4 inches lower.

Ekstrom-Carlson Trim Router

A trim router designed especially for the aircraft industry has been introduced by Ekstrom, Carlson & Co., Department M-4, 1400 Railroad Ave., Rockford, Ill. This machine, designated No. 327-T, is especially suited for trim routing large non-ferrous sections



Baldwin universal testing machine built in two new sizes



Ekstrom-Carlson trim router developed for aircraft industry

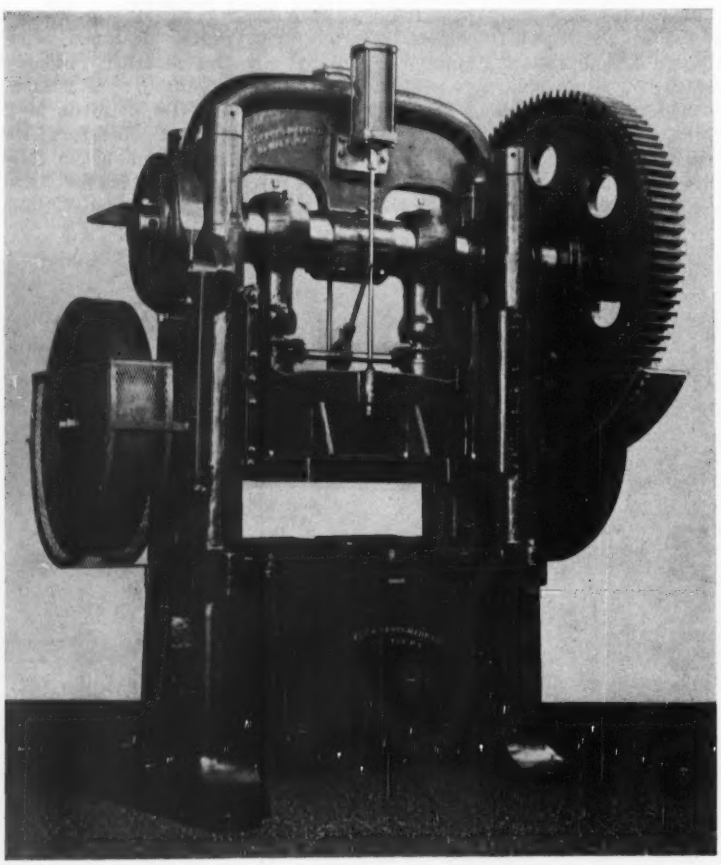
that are difficult to handle. Either of two spindle speeds—10,000 or 20,000 R.P.M.—is easily obtained by means of a selector lever and a simple belt change. A spindle drive motor with a speed of 3600 R.P.M. of 3, 5, or 7 1/2 H.P. is optional.

The machine has a throat depth of 27 3/4 inches and the height from the floor to the guide-pin holder is 32 3/4 inches. The adjustable distance from the end of the guide-pin holder to the face of the spindle ranges from a minimum of 3 inches to a maximum of 9 1/4 inches. A spring-loaded, sliding guide-pin holder provides a maximum stroke of 6 1/4 inches controlled by an adjustable stop.

Double-Crank Back-Geared Press

A double-crank back-geared press with a capacity of 150 tons has been added to the line manufactured by the Zeh & Hahnemann Co., 182-200 Vanderpool St., Newark 5, N. J. This press, designated No. 12-12B, is arranged for motor drive. The slide is balanced by air cylinders and has a ratchet mechanism for adjustments.

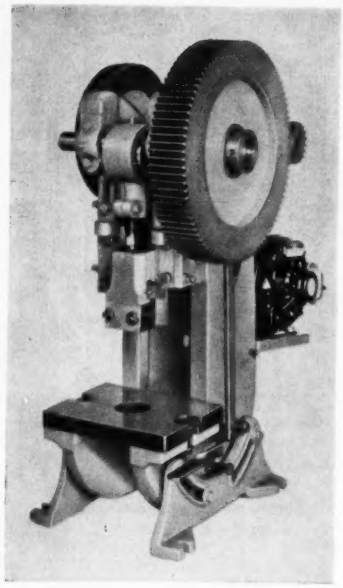
The distance between the press housings is 49 inches, the bed measures 32 by 39 inches, and the standard stroke rating is 4 inches, the maximum stroke capacity being 10 inches. The slide, which is 24 by 40 inches, has an adjustment of 5 inches. Shut height can be made to suit requirements. The press weighs 32,000 pounds and can be driven by a 15-H.P. motor.



Zeh & Hahnemann double-crank back-geared press

Benchmaster Punch Presses Equipped with Back-Gears

A series of punch presses designed for drawing, forming, and other press operations that require slow, powerful strokes has been brought out by the Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif. These presses are equipped with husky, stub-tooth back-gears which reduce the speed range 40 to 100 strokes per minute less than the normal feed. The speed can be varied by changing the size of the motor driving pulley.



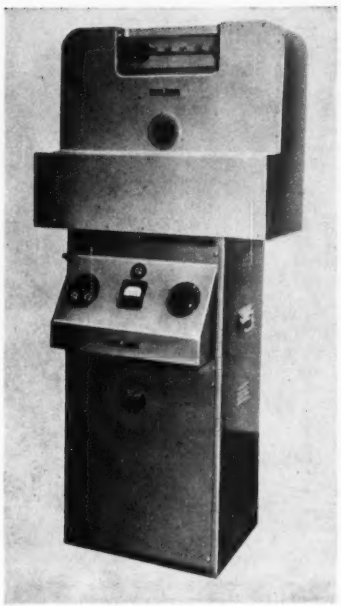
Benchmaster press of new series equipped with back-gears

The Benchmaster positive type, single-trip mechanism used in this series of presses requires the ram to be individually triggered for each stroke. The press can be converted for continuous operation, however, by the removal of one screw. Either hand or automatic feeding with one of the manufacturer's automatic friction roll feeds can be employed. Back-gearing is now available on three Benchmaster presses—the 4-ton standard, 4-ton deep throat, and 7 1/2-ton models.

"Circosonic" Degreaser for Metal Parts

The Topper Equipment Co., Clark Township, Rahway, N. J., has brought out a "Circosonic" cleaning machine that uses ultrasonic waves to clean metal parts. This machine is said to remove oil, grease, chips, dirt, lapping compound, and many other contaminants from the surface of small precision work-pieces at a rate hitherto unobtainable and to the most stringent cleanliness standards.

An ultrasonic generator manu-



Degreaser for metal parts brought out by the Topper Equipment Co.

factured by the General Electric Co. is used in this degreaser in conjunction with "Circo Vapor" degreasing equipment. The generator converts high-frequency electrical energy into high-frequency mechanical vibration by means of a quartz crystal. This energy is transmitted up through the cleaning tank. The region above the crystal is greatly agitated, accelerating the normal cleaning action. It is in this zone that the cleaning is accomplished.

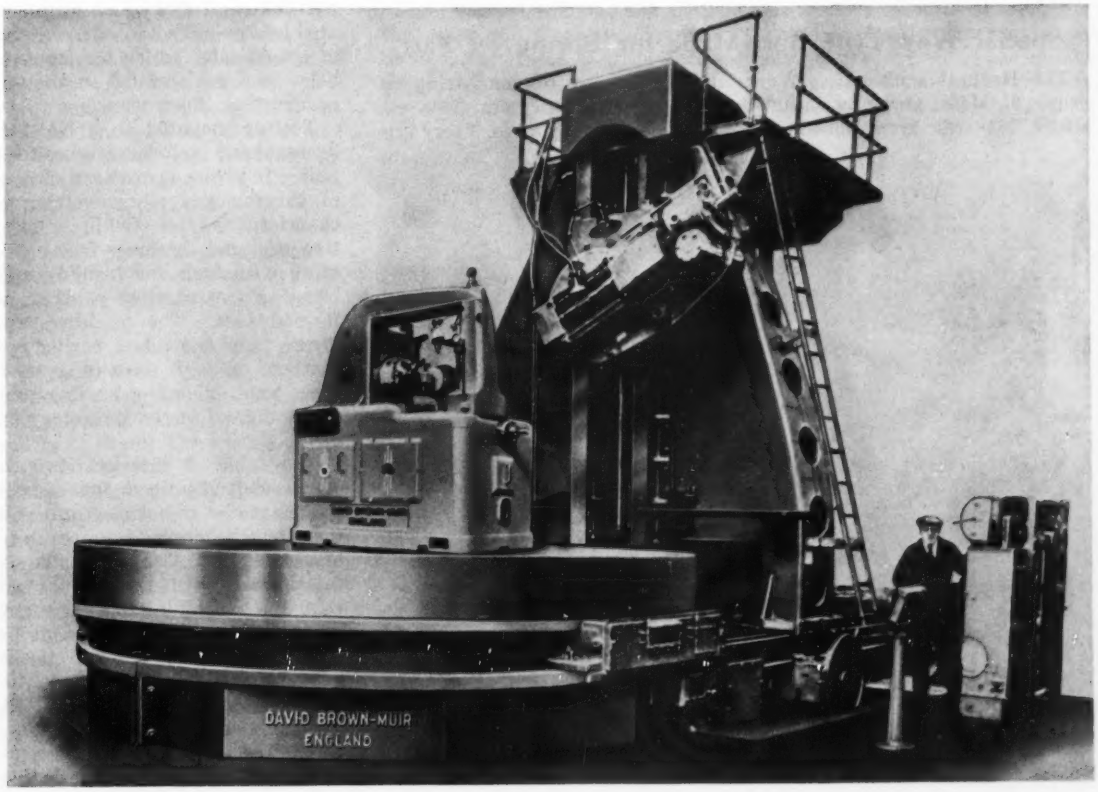
After the ultrasonic cleaning action takes place, the parts are rinsed with fresh, clean fluid and dried by the vapor process. The equipment is available for either continuous or batch cleaning operations. It is claimed to be especially effective where parts having complex shapes must be cleaned so that they will be free from contamination.

Complete Line of Gear-Hobbing Machines

The Morey Machinery Co., Inc., 410 Broome St., New York 13, N. Y., is introducing in the United States a complete line of gear-hobbing machines manufactured by David Brown Machine Tools Ltd., of England. These machines are available in capacities ranging from 15 to 240 inches. The various types included in this line are universal gear hobbers, pinion-hobbing machines, gear-shaving machines, spline-hobbing machines, production hobbing equipment, and relieving lathes. The accompanying illustration shows a 15-inch gear hobber, the smallest size machine of the new line, resting on the table of a 240-inch machine, which is believed to be the largest of its type in the world.

Cutting Lubricant

The Anchor Chemical Co., 10721 Briggs Road, Cleveland 11, Ohio, has announced a unique cutting lubricant for tapping, threading, spot-facing, counterboring, form-finishing, etc. This lubricant, known as "Anchorlube," has been developed to provide a positive adhesive film between the tool and the work to eliminate friction resulting from metal-to-metal contact, thus increasing tool life.

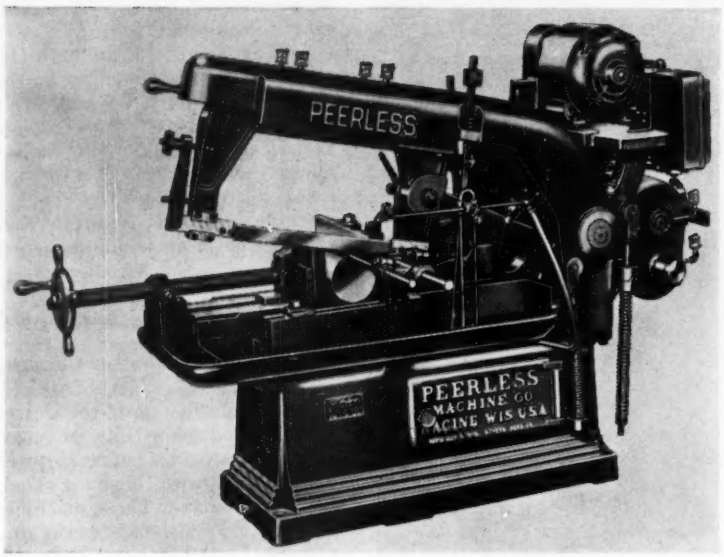


Smallest and largest gear-hobbing machines of line introduced in this country by the Morey Machinery Co., Inc.

Peerless Over-Arm Metal-Cutting Saw

A 10- by 10-inch metal-cutting saw designed to replace an earlier 9- by 9-inch size has been announced by the Peerless Machine Co., 1600 Junction Ave., Racine, Wis. The new model is an over-arm type with an open saw frame designed to permit loading from front or side. The over-arm is much heavier than that of the tool it replaces, and it carries and guides the saw frame, giving it the best possible control for a saw of this type. This rugged construction feature is said to give additional accuracy and increase production.

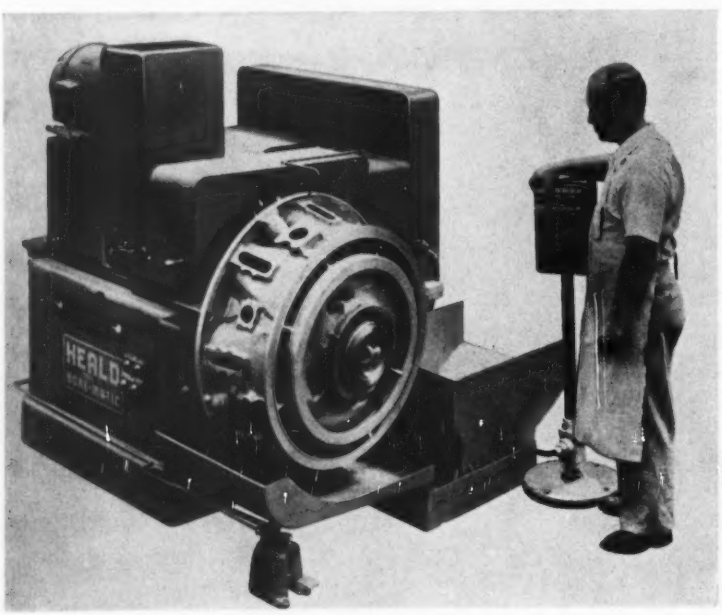
Another feature is the heavy U-shape saw frame. In addition to its heavier construction, this frame has wider shoulders than its predecessor, assuring true alignment and consequently greater accuracy. The saw frame also has replaceable, hardened and ground steel bearing shoes. The table of the saw provides a good working surface, and the work clamping vise is arranged to clamp work at any angle from 90 to 45 degrees. The holding jaw is easily set at the desired angle and the clamping jaw adjusts itself automatically to the work. A centrifugal force coolant pump assures coolant flow at all times without danger of chip trouble.



General-purpose metal-cutting saw announced by the Peerless Machine Co.

Special Way Type Bore-Matic for Boring Jet Part

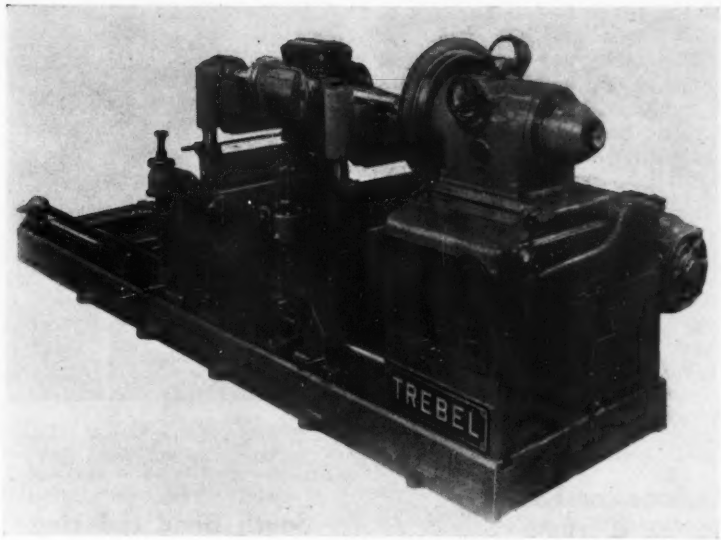
The Heald Machine Co., Worcester 6, Mass., recently built a Model 331 way type Bore-Matic designed for precision boring operations on a jet part. This machine is basically a No. 3 way type unit with a vertical, indexing eight-station fixture. Handling of heavy awkward parts is facilitated by the low mounting position of the fixture on the way unit. The indexing mechanism is hand-operated, with location at each position controlled by an air-operated locator-pin actuated by means of a foot-valve which can be seen below the work guard in the accompanying illustration.



Heald special way type "Bore-Matic" equipped to handle jet parts

Tooling mounted on a No. 218 boring head includes a cross-feed unit. In-stroke operations consist of turning and plunge-cutting a chamfer, the table striking a positive stop and the cross-feed operating with tools for forming and blending two radii to generate a formed face. The machine performs forty individual boring operations on each part in a total cycle time, including loading and unloading, of twelve minutes per piece.

The table is interlocked with the cross-feed unit so that it will not start the out-stroke until all tools on the cross-feed are clear of the work. Also, the table is interlocked with the fixture so that the machining cycle cannot be started until the part is properly indexed. A pedestal push-button control panel allows the operator to control the machine at a point close to the loading station. The operating cycle is completely automatic after the "table in" button on the control panel is depressed.



Dynamic balancing machine introduced in this country by Kurt Orban Co., Inc.

Trebel Dynamic Balancing Machine

A Trebel dynamic balancing machine now being distributed by the Kurt Orban Co., Inc., 205 E. 42nd St., New York 17, N. Y., operates on the principle of introducing a counter motion into the bearings in which the piece rotates until a smooth running condition is obtained, in a matter of seconds. At this point the machine indicates the magnitude, as well as the location, of unbalance in ounce-inches to an accuracy within 0.000025 inch displacement of center of gravity. On more specialized work, indicators in any other desired units may be obtained, such as the numbers of holes to be drilled or slugs to be added.

The machine consists of a bed, headstock, drive motor, and two independently movable supports. The supports carry open bearing rollers on which the work-piece is rotated. Special half-shoes for babbitt bearings or V-holders for accommodating ball bearings may also be provided. The electronic amplifier housed in the headstock incorporates a filtering unit and a rectifier, and serves the purpose of showing the most minute unbalance vibrations.

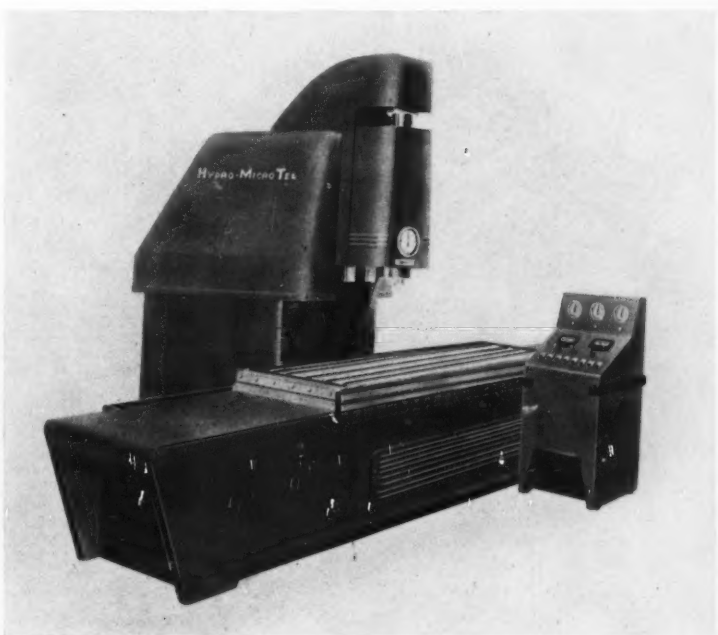
The positive drive is made possible by the use of a carrier band on the faceplate of the headstock, which engages a simple driving dog on the work-piece. Plane selectors are placed underneath the previously determined planes of compensation of the work-piece. At these plane selectors a cam introduces the counter vibration, which is transmitted through a spring to the nodal bar and then to the bearing supports.

Two handwheels, one for angle, the other for magnitude, control the counter force that is introduced into the bearings on which the work rotates. By turning the wheels, the counter force is varied to neutralize the force of unbalance. This universal dynamic balancing machine is available in eleven models with capacities for work weighing from 1/4 pound to 22,000 pounds and from 7 to 78 inches in diameter. Models for balancing impellers and other large diameter work are available.

Hydro-Microtel Vertical Tracing and Milling Machine

A precision vertical milling machine and precision tracer or profiler manufactured by the Hydro Microtel Corporation and the Laboratory Corporation of America have been announced by the DeWitt Lewis Co., 3629 Sophia St., Wayne, Mich. The machine is built in two sizes, the tables having a working surface of either 30 by 96 inches or 30 by 126 inches. Automatic dynamic support leveling of the table is a feature designed to keep the table level regardless of any change in the weight of the work resulting from the removal of metal or uneven loading.

An automatic precision tracer mechanism is optional equipment which serves to synchronize the vertical movements of the spindle-carrier with the table or cross-slide movements to accurately du-

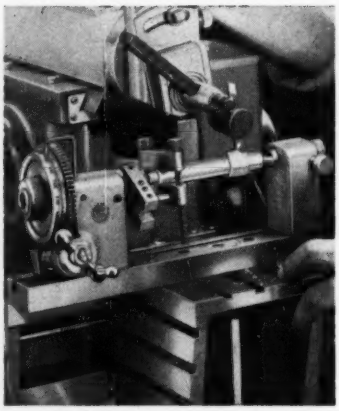


Hydro-Microtel vertical milling machine with master control panel

plicate the contours of master shapes and templates. This attachment is especially useful in die-sinking operations.

Selective spindle speeds from 0 to 2800 R.P.M. are available through the "Maxi-Trol," which provides for instant stopping and reversing. A novel feature of this machine is a built-in lucite lens around the spindle quill housing which throws light directly on the working area and completely around the spindle. Vertical travel of the spindle head is 15 inches, the rate of travel being selective within the range of 0 to 200 inches per minute. Depth control of the power feed is accurate to 0.0001 inch.

The table has a longitudinal travel of 72 inches for the smaller size machine, 104 inches for the larger. Both models have a cross travel of 34 inches. The spindle head has a vertical travel of 15 inches. Maximum distance from top of table to spindle nose is 27 inches, and the minimum distance 12 inches. Both machines have a throat depth of 40 inches. Stepless feeds for all movements range from 0 to 50 inches per minute. Table and head movements can be preset for travel speeds of from 0 to 200 inches per minute.



South Bend indexing centers mounted on shaper for machining flats

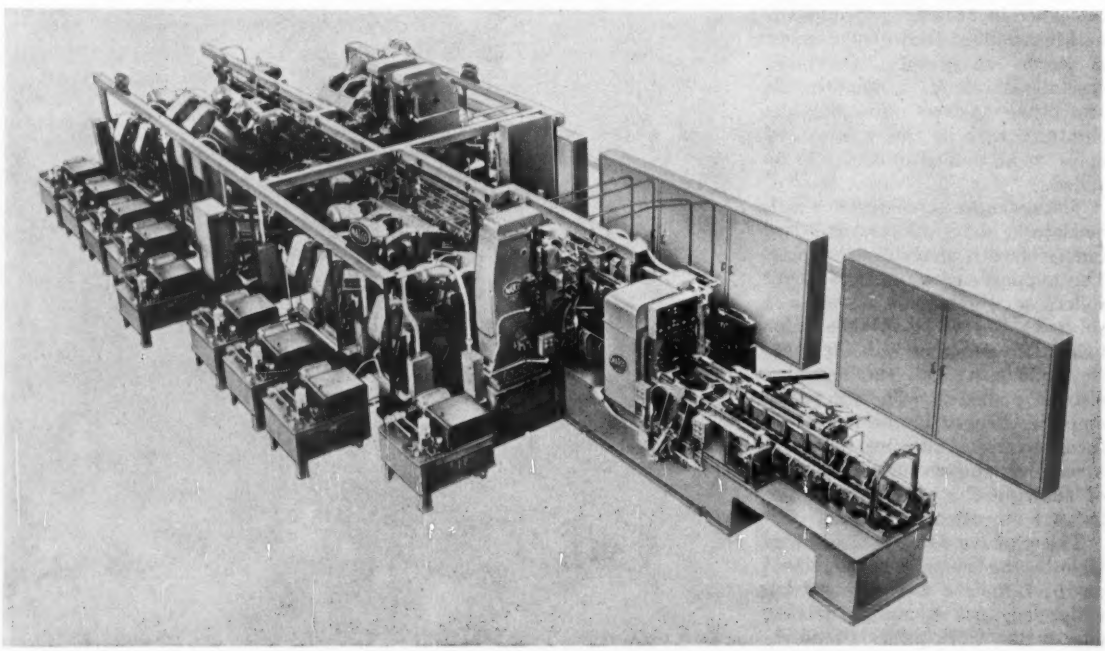
South Bend Indexing Centers

South Bend Lathe Works, South Bend 22, Ind., is now marketing sturdily built indexing centers designed for small precision work up to 5 inches in diameter and 6 inches in length. This equipment is suited for dividing operations such as required in machining splines, flutes, and gears. It is also useful in milling, shaping, and grinding square, hexagonal, or angular-shaped parts. Cross-drilling can be held to close tolerances with the indexing centers.

Natco "Holeway" Machine for Rapid Machining of Engine Blocks

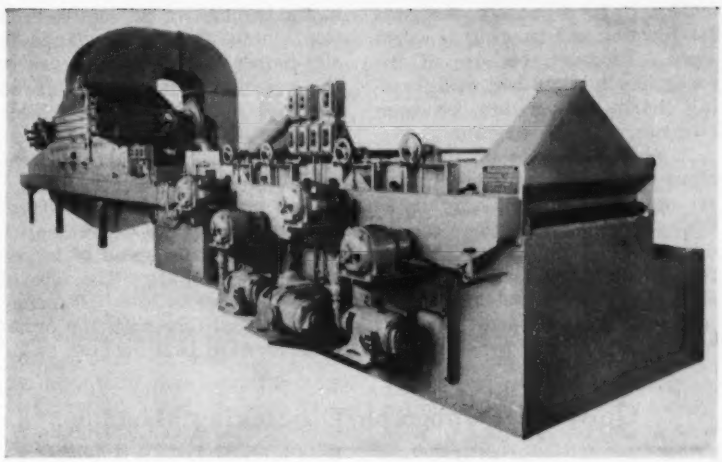
The National Automatic Tool Co., Richmond, Ind., has recently finished building a large Natco "Holeway" machine which is capable of performing fifty-five operations on engine blocks at the rate of nearly two parts per minute. Operations include milling, drilling, combination core-drilling and chamfering, combination rough counterboring and spot-facing, rotating the part 180 degrees, and vibrating it to remove the chips and also to permit inspection of the holes.

The machine has nineteen stations and requires only one operator. It has both right- and left-hand angular heads positioned at 17 and 45 degrees above the horizontal. The drilled and tapped holes range in size from 1/4 inch to 1 3/4 inches in diameter. At one station a vertical head is employed to mill a seat 4 inches in diameter around the hole for the oil breather tube. The first and the last stations of the machine are used for loading and unloading the work-pieces.



"Holeway" machine built by the National Automatic Tool Co. for machining engine blocks

The head-center is equipped with a graduated collar, and can be rotated by means of a ball-crank and worm-gear. Each graduation indicates a center movement of 3 minutes, while a complete turn of the ball-crank revolves the center 5 degrees. A dial on the worm-wheel is graduated to 360 degrees. For quick positioning of the center, the worm-gear can be disengaged and a clamping device used to lock the head-center in any desired position. As an added feature, the plunger type tail-center with automatic spring tension permits removal of the work without disturbing the head-center setting. A knurled thumb-screw locks the tail-center securely in place.



Machine developed by Gilron Products Co. for the application of "Drawcote" lubricant to metal sheets and blanks

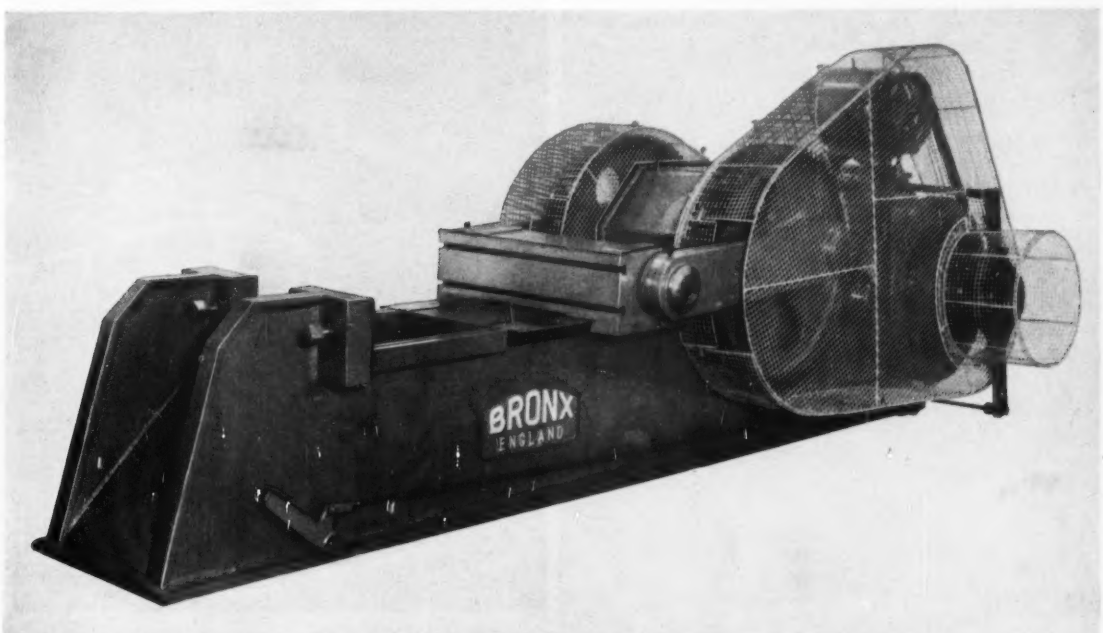
Machine for Applying "Drawcote" Lubricant to Sheets and Blanks

A machine designed especially for the application of Drawcote lubricant to sheets and blanks is announced by the Gilron Products Co., 6007 Euclid Ave., Cleveland 3, Ohio. Material can be processed through this machine at speeds up to 55 feet per minute. Three separate operations are performed. Sheets or blanks to be coated enter the washer unit where rotary brushes clean the stock with an alkaline cleaner. Operation of brushes on both top and bottom of material during the wash and rinse stages is said to assure fast, positive cleaning.

The cleaned stock then enters the self-contained coating unit where it is handled in a horizontal position for easy loading and stacking. The steam-heated, fully enclosed solution tanks can handle blanks up to 48 inches in width. After coating, the stock enters the drying element, which is available with steam, gas, or electrically heated ovens.

Bulldozer for Forming and Bending Warm Stock

A large forming and bending machine manufactured by Bronx Engineering, Southbridge, England, is being placed on the market in this country by the British Industries Corporation, Department MPB, 164 Duane St., New York 13, N. Y. This Series B100



Bulldozer introduced in this country by the British Industries Corporation

bulldozer is especially designed for forming and bending of warm stock. However, because of the exceptionally rigid bed, cold-forming can be done within the capacity range of the machine.

A unique feature of this machine is that different tools can be set up on top of one another so that successive operations can be done in the same heat. Also, a few small changes make it possible to perform upsetting, punching, and shearing operations. The machine is driven by a 10-H.P. motor through an adjustable friction clutch which is designed to slip before any damage occurs to the machine in the event of an overload. The brake and clutch are interconnected, so that the operator can "inch" the machine with complete control.

This machine has a capacity of 100 tons, a stroke of 10 inches, and an operating speed of fifteen strokes per minute. The face of the cross-head is 36 by 10 inches. Daylight opening with the cross-head forward is 10 inches.

Universal Pantograph Die-Sinking Machine

The Cosa Corporation, 405 Lexington Ave., New York City, is introducing a Deckel Model KF12 universal pantograph die-sinking machine designed to perform a wide variety of copy milling operations ranging from die-sinking of large and intricately shaped dies and molds to light engraving. The pantograph system permits two- or three-dimensional milling at a 1 to 1 ratio and at reduction or enlargement ratios ranging from 1 to 1.5 up to 1 to 4.

The cutting areas and working capacities of this machine have been increased. In a single set-up, the cutting tool will cover an area of 15 3/4 inches square or 10 by 19 3/4 inches. These cutting areas can be utilized to their fullest extent even with die-blocks up to 15 3/4 inches in height.

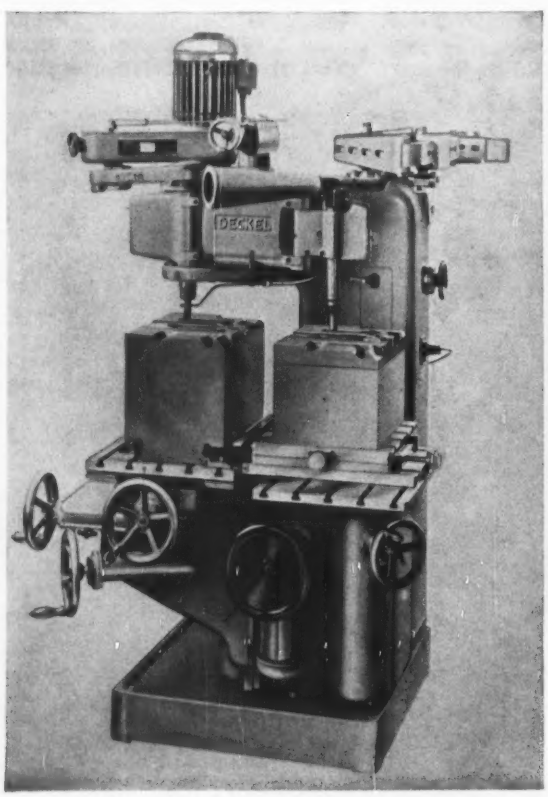
The power-operated vertical saddle permits both the master and the work-piece to be raised or lowered simultaneously at the rate of 30 inches per minute. This reduces the "down" time for setting up and tool changing. Even the heaviest work-piece is positioned vertically to a fraction of an inch.

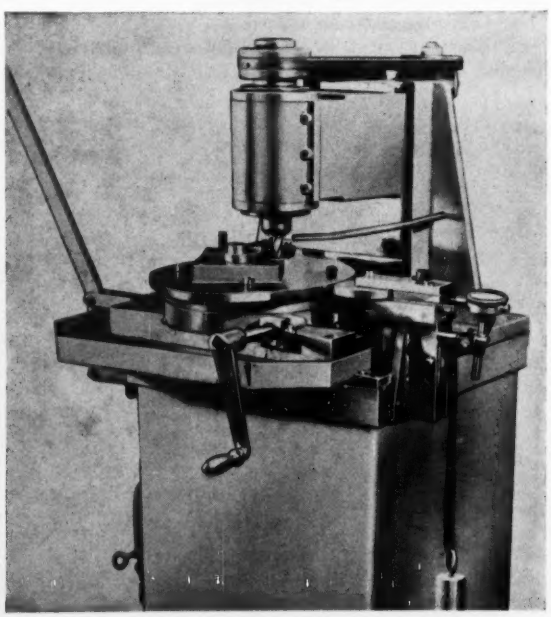
The rough-milling spindle has a built-in speed reducer. The spindle accommodates collets for chucking tools with No. 2 Morse taper or straight shanks up to 3/4 inch in diameter. The 1 1/2-H.P. spindle motor assures positive non-slip spindle operation even under low speeds and heavy cuts. Infinitely variable spindle speeds range from 60 to 10,000 R.P.M., permitting the selection of the most economical cutting speed for any material, whether hard alloy steels, nonferrous metals, or plastics.

The improved circular forming attachment, which is easily mounted on the tool-slide, allows circular forming operations in both vertical and horizontal planes and on inclined surfaces.

Cam Type Profile Mill

A profile mill for the precision milling of profiles, irregular shapes, and hexagonal and geometric forms has been developed by the Spike Mfg. Co., 24609 Middlebelt Road, Farmington, Mich. This mill is said to work to a close tolerance. Cams and fixtures used on the mill are built to customer specifications. The precision-ma-





(Above) Cam type profile milling machine placed on the market by the Spike Mfg. Co.

(Left) Deckel universal pantograph die-sinking machine introduced by Cosa Corporation

chined cam is made to suit the maximum capacity of the machine. Set-ups for various jobs can be made by simply changing cams.

Improved "Burgmaster" Drilling and Tapping Machine

A "Burgmaster" Model 3-BH, eight-spindle, automatic hydraulic drilling and tapping machine has been brought out by the Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles, Calif. This machine is designed to meet the demand for a larger "Burgmaster" than the Model 2A previously introduced. It is said to give exceptional results on straight drilling operations, or on complicated inside or outside diameter turning with forming tools. Tapping, threading, plunge-cut end-milling, counterboring, spot-facing, and other second-operation work can also be handled efficiently.

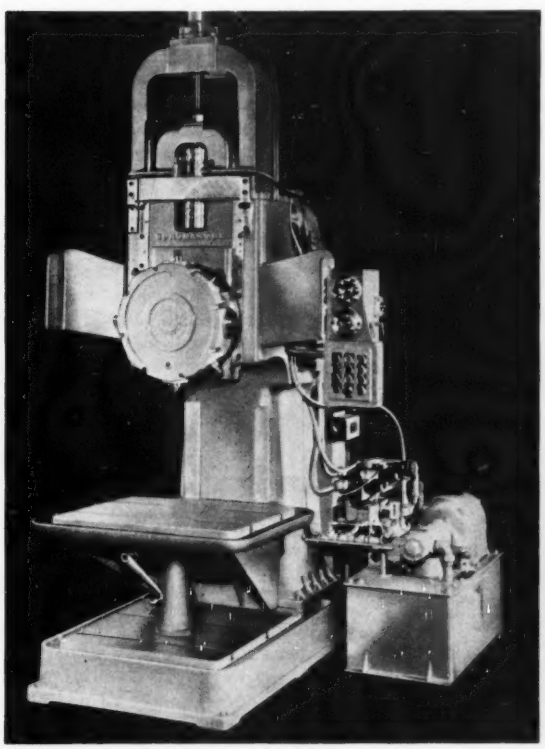
Each of the eight spindles has a capacity for drilling 1 1/4-inch holes in mild steel. The spindle and head have a travel range of 12 inches, the table a travel of 19 inches, and the throat clearance is 17 1/2 inches. T-slots are provided in the table, which has a work-holding surface of 36 by 35 inches. A two-speed 10-H.P. motor furnishes the drive for the spindles, which have twelve preselective speeds ranging from 167 to 1765 R.P.M.

Automatic cycling through any or all stations is a feature of this machine, permitting rapid approach, feed, dwell, slow feed out, rapid traverse out, and preselective speed for each spindle. Button controls are provided for use in setting up and for hand operation. The machine requires a floor space 6 by 6 feet, is 10 feet high, and weighs about 6200 pounds.

G-E Redesigned Welding Transformer

A redesigned 300-ampere alternating-current welding transformer, with provision for stepless current selection from 40 to 375 amperes, has been announced by the General Electric Co., Schenectady 5, N. Y. This equipment is designed for practically all welding applications from light-duty, low-current sheet-metal work to the heavier-duty, high-current industrial welding jobs. An enlarged scale and finely threaded screw adjustment are provided to facilitate current selection. The welder accommodates electrodes from 3/32 to 1/4 inch in diameter, and has a handy range switch to provide quick changes in current.

Arc-stabilizing capacitors in the redesigned equipment contribute toward higher production by enabling the operator to strike and maintain an arc without "pop-outs." Extra protection against high temperature coil failure is provided by silicone insulation, which retains its mechanical and electrical strength at high temperatures. To further protect the coils from hot-spots, forced-draft ventilation is provided by a fan designed for continuous duty. Studs at the base of the welder simplify the connecting of electrode and work cables. Power-factor-correction capacitors assure low power costs. The welder is 36 inches high, 21 inches in diameter, and weighs about 328 pounds.



"Burgmaster" large-capacity automatic drilling and tapping machine



Redesigned welding transformer announced by the General Electric Co.

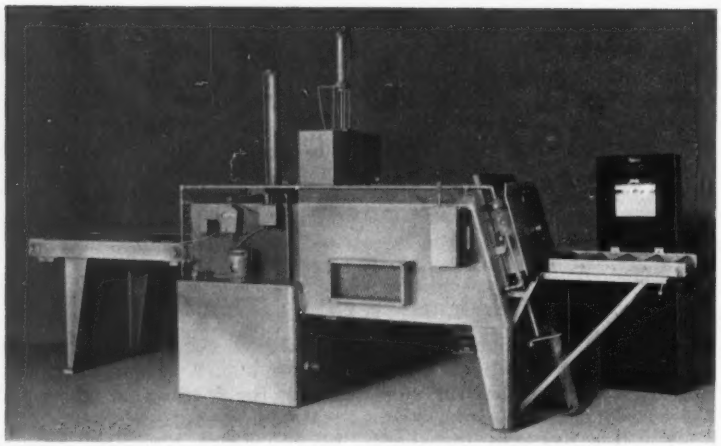


Fig. 1. Ipsen automatic controlled-atmosphere draw-quench unit

Ipsen Automatic Controlled-Atmosphere Draw-Quench Unit

A combination draw-quench metal-treating unit, designed for both bright, scale-free tempering and controlled oxidation tempering from 400 to 1400 degrees, has been announced by Ipsen Industries, Inc., 715 S. Main St., Rockford, Ill. This D-Q 300 furnace is a fully automatic, sealed unit with the heating chamber separated from the combination cooling chamber and quench tank by a sealed inside door, as shown diagrammatically in Fig. 2.

Controlled endothermic atmosphere is provided in both heating and cooling chambers. Parts being treated do not contact air at any time during tempering, and work that has been previously bright-hardened remains clean and scale-free, eliminating blasting or pickling operations. Because of the controlled atmosphere, oxidation or blue tempering is held within strict limits.

Draw and quench are combined in a single unit, making possible transfer of heated work into the quench or cooling zone without furnace cooling or work handling delays. After completion of the heating cycle, the intermediate door opens automatically and chain-driven rods move into the heat zone, contact the load with cam-actuated arms, and transfer the trays to the quench rack. The intermediate door is resealed automatically, allowing another work tray to be loaded. The tray rack holds work for atmosphere cooling, or lowers it for oil quenching.

Electric heating elements are located in the hearth below the load and an alloy fan circulates atmospheres through the load. Temperatures of the sealed quench and cooling zone are held automatically by immersion heating elements and water jackets around the cooling chamber. Two motors circulating the oil downward through the load provide any combination of slow, moderate, or drastic quench. The quench rack and the loading, intermediate, and unloading doors are operated by air-hydraulic equipment. Settings on the control panel predetermine the timing of the unit cycles, temperature, and work transfer.

Although designed especially for bright tempering and controlled oxidation of steel, the D-Q 300 unit can be effectively used for straight heat-treatment of steels below the critical point, for annealing of copper and brass, solution heat-treatment of aluminum, and the precipitation, or solution heat-treatment, of beryllium copper. The hearth is 24 inches wide, 36 inches deep, and 12 inches high. The unit is 4 feet 8 1/2 inches wide, 18 feet 6 inches long, and 9 feet 4 inches high.

Universal Multiple Spline or Groove Milling Head

A head for the milling of multiple splines, grooves, or slots of all types in drive shafts, propeller shafts, and miscellaneous items requiring splines or grooves is being introduced by Earle G. Boyer, Box 4909, Philadelphia 19, Pa. Various types or shapes of multiple splines or grooves can be milled by merely changing the cutting tools, which are adjusted to an accurate micrometer setting from the outside while the tool is in operation.

Machined parts requiring square or hexagon end-milling operations can be handled by changing the position of cutter holders and cutters to meet requirements. The milling head can be operated in an ordinary drill press, engine lathe, or other non-critical shop tool,

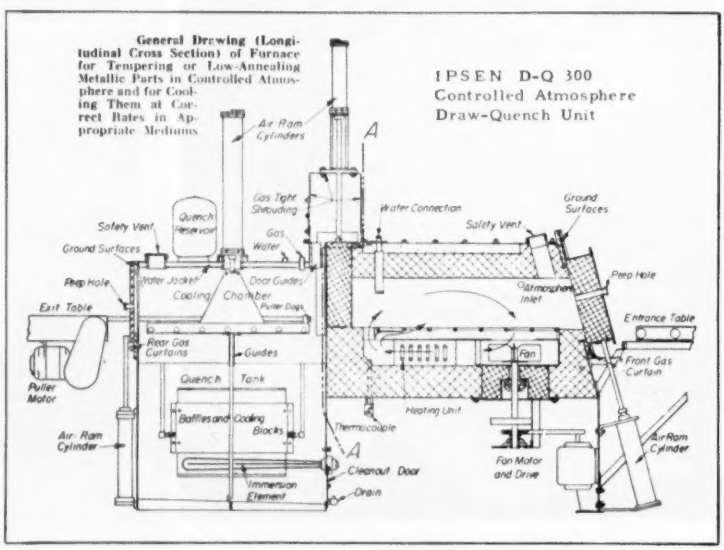


Fig. 2. Diagram illustrating features of unit shown in Fig. 1

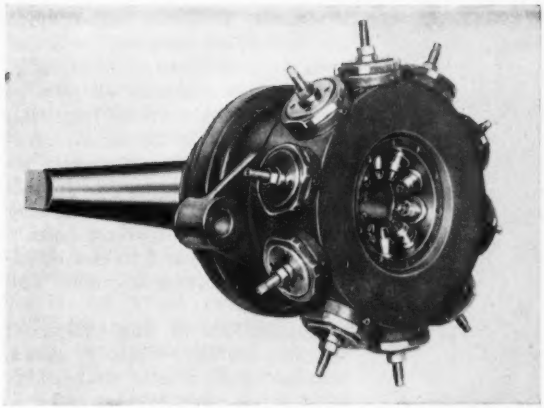


Fig. 1. Multiple-spindle head for milling splines, flutes, and grooves, developed by Earle G. Boyer

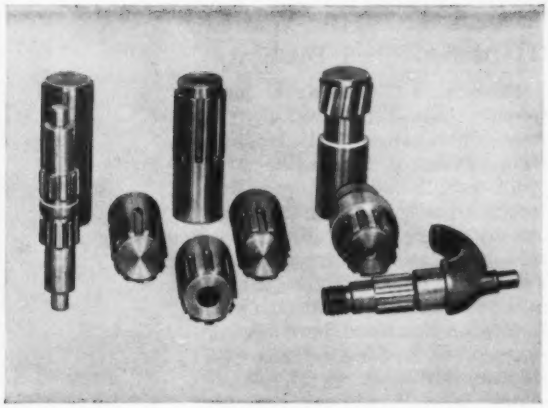


Fig. 2. Examples of splined work produced by multiple-spindle milling head seen in Fig. 1

thereby releasing high-powered special equipment for other work.

The head will operate in forward or reverse directions, longitudinally, vertically, or at any angle. Splines or grooves can be milled straight or spiral. The head is made in splining capacities of from 3/4 inch to 5 inches in diameter, and can be used for multiple-production fluting requirements on taps, reamers, counterbores, spotfacers, and all types of special cutting tools.

Pratt & Whitney Gaging Device Developed for Wide Range of Applications

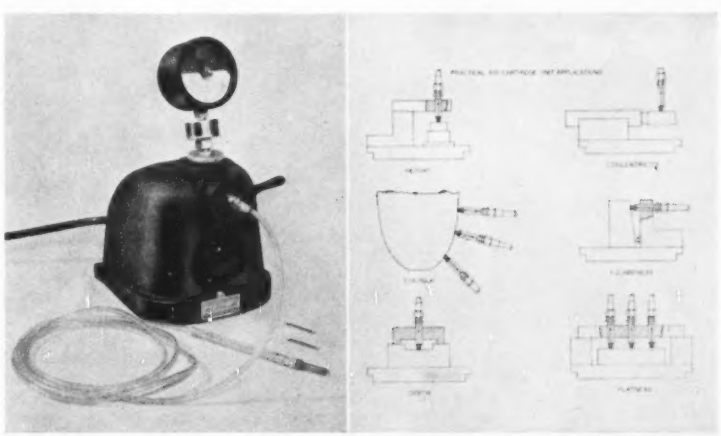
An air cartridge unit gaging device for use in conjunction with Air-O-Limit gages has been developed by the Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. This unit can be used in both single- and multiple-station fixture type gages. Practical applications include checking such factors as squareness, height, contour, concentricity, flatness, and depth, as shown diagrammatically in the views at the right in the illustration.

Internal and external average diameters can be checked by employing multiple cartridge units in a gaging plug or ring. Many large diameter parts have broad out-of-round tolerances and must be measured for average diameter, this being accomplished by using the air cartridge units in multiple. The unit can be applied to machine tools to indicate run-out. As a direct size indicator, it will give the operator an indication as the finished dimension is approached. Height gage applications in connection with surface plates can be made by mounting the air cartridge unit on a height gage stand and using it in conjunction with a standard P & W Model "F" comparator.

The unit consists of a plunger with a contact point on one end and a stainless-steel ball on the other which has an axial movement in the cartridge body. Air flow through the cartridge unit is restricted by the ball on the plunger which operates in a tapered hole in the body, thus setting up the back pressure required to operate the gage. A light contact of only 3 ounces is all that is needed to satisfactorily operate the cartridge unit.

The broad-scale air cartridge unit, when used with an Air-O-Limit gaging fixture, is calibrated by means of a set of minimum and maximum feeler gages, thus eliminating the necessity of employing calibrated masters. Once magnification is established with the feeler gages, it may be applied to any fixture and set at zero with a simple master or even a measured product. The unit is only 1 3/4 inches long by 3/8 inch in diameter. The back of the unit is threaded to fit the standard Natvar tubing for connection to the comparator.

Standard units are made primarily for coarse tolerance work, and are available in three magnification ranges operating on total scales of 0.010, 0.015, and 0.020 inch. However, units can also be furnished for total scales ranging from 0.0006 up to 0.003 inch.

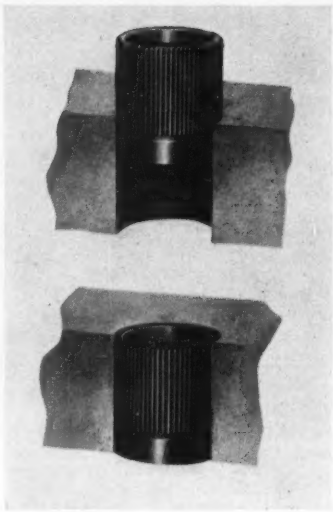


(Left) Pratt & Whitney air cartridge unit with Air-O-Limit comparator and master maximum and minimum feeler gages. (Right) Diagrams illustrating applications of air cartridge units

"Broach Fit" Thin-Walled Hardened Steel Bushings

"Broach Fit" bushings have recently been introduced by the Aeroquip Corporation, Jackson, Mich., designed to provide foolproof installations and precision results in a wide range of applications where thin-walled, hardened steel bushings are required. The unique feature of the bushing is the broached outer surface consisting of dozens of hard-cutting edges. The bushing actually cuts its way into cast metal, plastic materials, steel, and other metals without danger of collapsing or cracking the parent metal. This feature eliminates the need for machining bushing holes to excessively close tolerances. For instance, where conventional type bushings require hole tolerances of 0 to 0.0005 inch, these bushings provide uniformly accurate results with a maximum tolerance of 0.002 inch.

A smooth surfaced, slightly undersized pilot on one end squares the bushing with the hole, as shown in the upper view of the illustration, thereby eliminating the possibility of cocking during assembly. As the bushing enters the hole, chip retainer grooves gather displaced metal. This feature creates a lock which holds the bushing firmly in position after insertion. If desired, however, the bushings may be removed and replaced with accuracy without reworking the hole. They are made of hardened steel treated with a black oxide penetrant to prevent rust and corrosion. The bushings are available in a wide range of sizes in both headless and headed types.



Views of Aeroquip "Broach Fit" bushing illustrating the method of installation

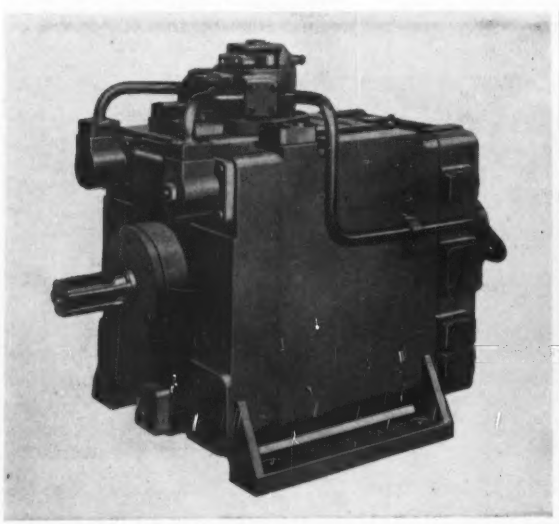
Variable-Delivery Hydraulic Pumps

A series of heavy-duty positive displacement axial piston type pumps and motors originally developed for military applications is being introduced by Waterbury Tool, Division of Vickers, Inc., Waterbury 20, Conn. These pumps and motors are designed for either open or closed hydraulic circuits. They are particularly adapted to heavy machinery drives requiring precise control of torque, acceleration, deceleration, speed, and reversal. Hydraulic motors in this series are said to be outstanding in their ability to reverse quickly under full load, and to run at extremely slow speeds under full torque.

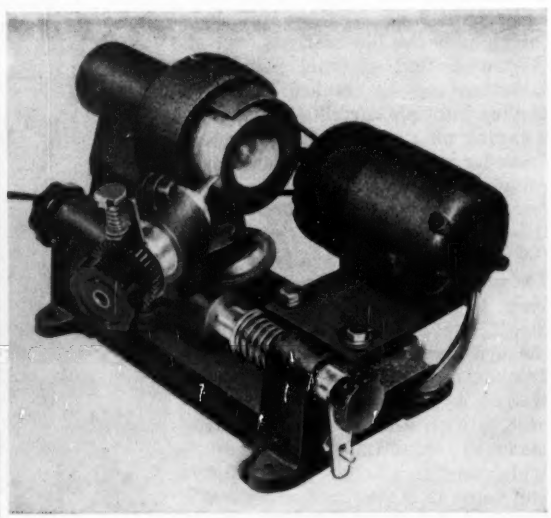
Applications of this equipment include marine steering gears, winches and hoists, drawbridge lifts, extra large presses and machine tools, rotary machine drives, steel mill billet gougers, and flying shears. The units are available in ten sizes with capacities of 28 to 2300 gallons per minute at rated speeds, and 50 to 4000 H.P. in a pressure range of 2000 to 3000 pounds per square inch.

Grinder for Sharpening Engraving and Routing Cutters

An improved, vibration-free grinder has been made available by the New Hermes Engraving Machine Corporation, 13-19 University Place, New York 3, N. Y. The machine, Model CG2, is intended to grind cutters from any type of engraving or routing machine. An outstanding feature of this machine is a precision ball-bearing spindle driven by a smooth, endless belt. The vibra-



Heavy-duty oil hydraulic pump of new series of pumps and motors built by Waterbury Tool, Division of Vickers, Inc.



Machine for grinding engraving and routing cutters, placed on market by New Hermes Engraving Machine Corporation

tionless grinding wheel resulting from this construction is said to produce smooth cutting edges on engraving and routing tools.

The tool-head is designed for spring collets, and has a capacity for holding cutters with 1/2-inch shanks. It is equipped with an indexing device for grinding single lip two-, three-, and four-sided cutters. This grinder is simple to operate, and any inexperienced worker can grind cutters concentrically, with the desired profile and the proper clearance.

Sundstrand "Power-Grip" Chuck

A magnetic chuck featuring multiple poles for maximum work-holding surface, has been added to the line of "Power-Grip" chucks manufactured by the Sundstrand Magnetic Products Co., Division of Sundstrand Machine Tool Co., Rockford, Ill. This chuck has closely spaced separators made of 0.050-inch wide brass separated by a 1/8-inch wide mild steel spacer. The 100 per cent silver brazed construction results in a very rigid base for precision grinding.

The advanced design of the "Power-Grip" chucks and the efficiency of the Sundstrand low-voltage winding are said to give uniform holding power over the entire face of the chuck. The full work surface holding area is suited for holding small, thin parts having limited areas of contact with the chuck.



Federal master comparator checks inside and outside dimensions

Horizontal Master Comparator for Checking Inside and Outside Dimensions

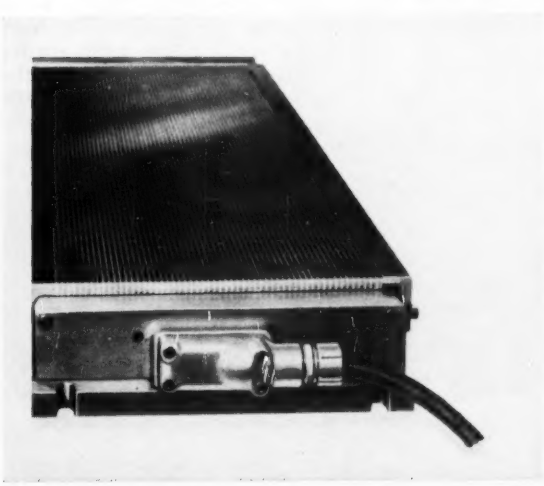
An entirely new measuring instrument referred to as a horizontal master comparator has been developed by the Federal Products Corporation, 1144 Eddy Street, Providence 1, R. I., to provide practical high-precision dimensional comparison. Its friction-free sensitivity is said to assure repetitive accuracy that makes possible extremely accurate measurements. All amplification is accomplished by an electronic circuit. One of the features of the instrument is the provision for applying a constant pressure to the sides of the work-piece by each contact at every point of measurement. This pressure is exactly the same for every part inspected.

Four magnifications are available — 500 to 1, 1500 to 1, 5000 to 1, and 15,000 to 1 — all on the same meter. These magnifications, together with the exceptional range of the measuring contacts, make it possible for the operator to use the same instrument for easy tracing of the work from rough-grinding to finish-lapping with the set-up on low magnification, and then to quickly switch to high magnification for accurate size determination. It is said that an operator observing common sense precautions, such as constant temperature, cleanliness, and correct operating procedure, can obtain "repeat" readings and detect dimensional variations to one-millionth of an inch.

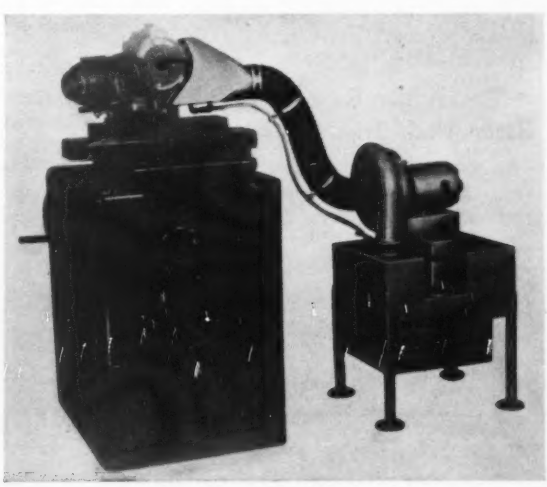
"Vap-Air Exhaust" for Collecting Diamond Dust from Grinding

The Shelboerg Mfg. Co., 29 Ridgeview Drive, Indianapolis, Ind., is building a dual-purpose machine known as "Vap-Air Exhaust." First, it supplies an accurately controlled flow of coolant to the center of a diamond grinding wheel, thus assuring even distribution of coolant on the wheel and increased wheel life.

Excess coolant from the wheel is sucked into a hood which can be adjusted to the right position for

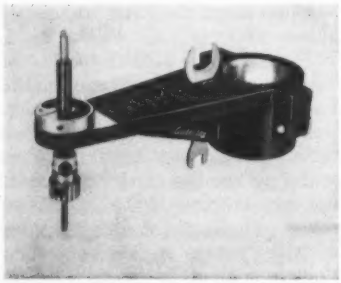


"Power-Grip" magnetic chuck with large work-holding area made by Sundstrand Magnetic Products Co.



Machine built by Shelboerg Mfg. Co. to supply coolant to diamond grinding wheels and to reclaim diamond dust

any machine set-up. The second purpose of the machine is to reclaim the maximum amount of diamond dust.



Lead-screw tapping attachment made by Automatic Methods, Inc.

Lead-Screw Tapping Attachment

A lead-screw tapping attachment for use in a standard drill press is announced by Automatic Methods, Inc., Division 163, 42 Walnut St., Newark 2, N. J. The "rolled thread" lead-screw and adjustable split-nut of the attachment are designed to carry the driving load, whether applied by an unskilled operator or by other means, thereby taking practically all the strain from the tap except that required for actually cutting the thread. This attachment, called the "Autotap," has a new type of arm for mounting on standard drill presses.

Taps are held in Jacobs "Rubberflex" collets which accommodate sizes from No. 0 to 1/4 inch and No. 10 to 5/16 inch. The twelve lead-nuts are adjustable to compensate for wear and cover a tapping range of twenty to eighty threads per inch.

Torch for Removing Riser Pads from Castings

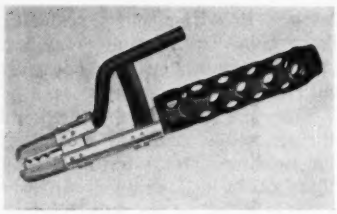
An oxy-acetylene flame-washing torch for removing riser pads from castings has been developed by the National Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill. The design of the torch is such that it produces a washing, rather than a grooving or cutting action, which leaves a smooth surface that seldom requires additional finishing. It is available with 20- or 75-degree angle heads, and with two sizes of tips which are adaptable to many other foundry cleaning room jobs, such as removal of chill bars and shallow cracks.

Tool for Driving Threaded Inserts in Aircraft Parts

The Titan Tool Co., Main St., Fairview (Erie County) Pa., recently announced a new bushing driver for driving threaded inserts for aircraft and general industrial applications. This tool is designed to provide automatic positioning of the threaded inserts at the proper depth below the face of the casting. A ball bearing pressure plate prevents the insert from backing out.

Eastman Hydraulic Hose Coupling and Adapter Union

Having met severe tests by the Marine Corps on earth moving equipment, and the U. S. Navy on rocket launching devices, the Eastman Mfg. Co., Manitowoc, Wis., is releasing its "MR" hydraulic coupling and adapter union for hose. Tests have shown that even with hose as large as 1 1/4 inches inside diameter, the standard "O-Ring Seal" used is so effective that this coupling has proved absolutely leakproof upon being subjected to pressures up to 5000 pounds per square inch, when drawn tight by hand. The rings can easily be replaced when they become worn.



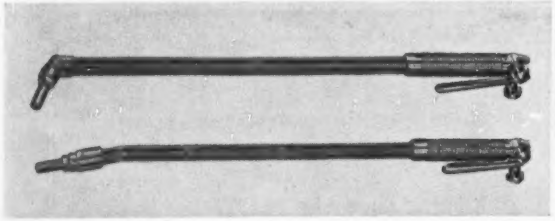
Electrode-holder announced by the Lincoln Electric Co.

"Cooltong" Electrode-Holder

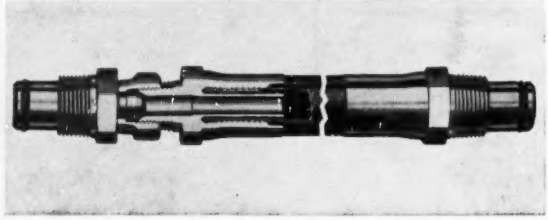
A "Cooltong" 400-ampere insulated electrode-holder has been marketed by the Lincoln Electric Co., Cleveland 17, Ohio. This holder has several patented features said to give longer service life and cooler operation than is normal with conventional holders of similar capacity. In one field test, for example, the holder remained cool enough to permit operation with the bare hands when using a current of 400 amperes.

The nose is of a special "sandwich" construction consisting of a copper core between four and six layers of laminated, glass impregnated, plastic cloth. This construction gives longer service life because the copper core, in addition to serving as a reinforcement, dissipates heat so that it will not concentrate in the nose and thus cause the insulation to deteriorate. The jaws, which are covered by this special insulating construction, are made of tough, highly conductive Mallory 3 metal of the non-spatter type. They will handle electrodes from 1/8 to 5/16 inch.

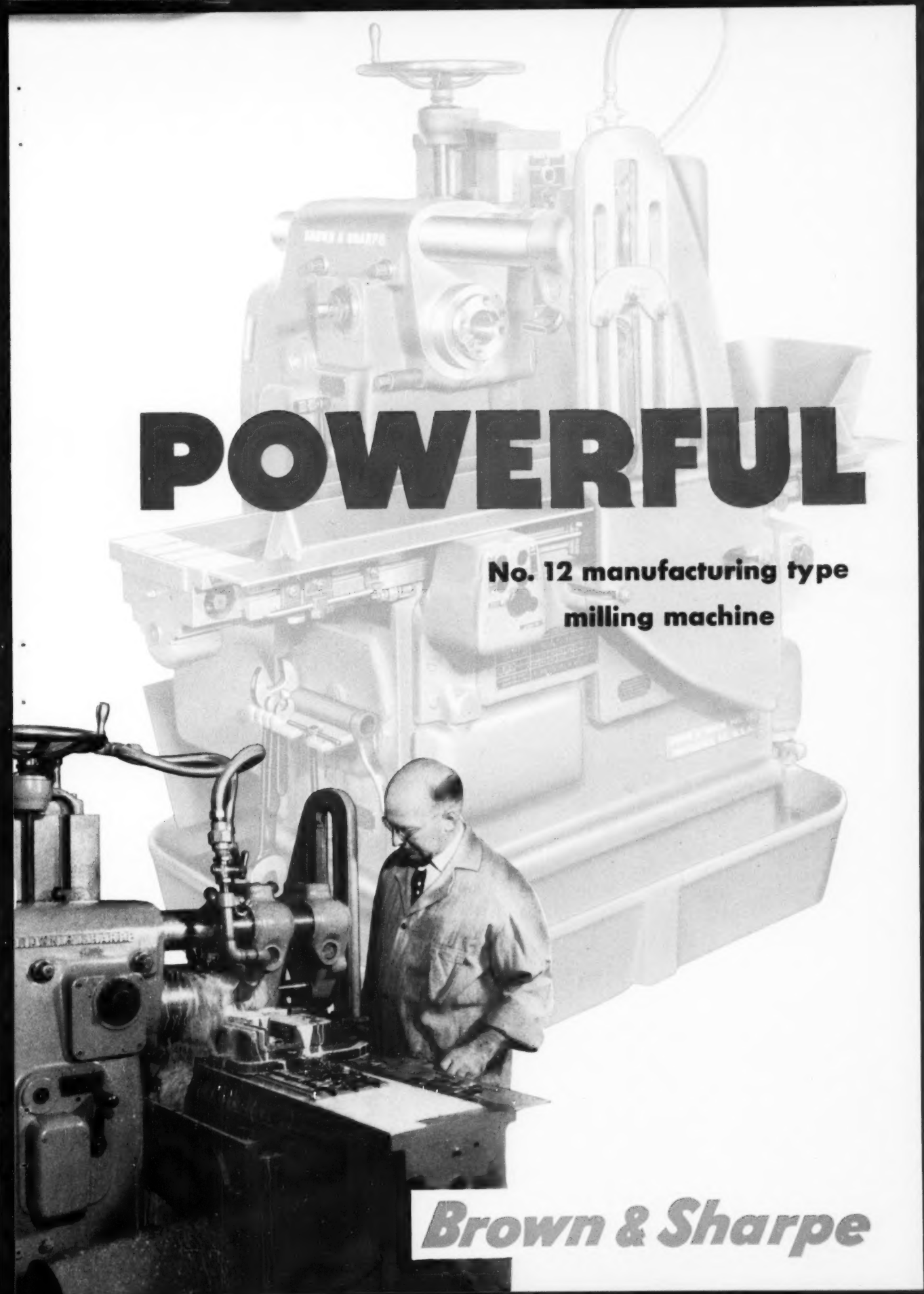
Current-carrying frame parts are made of pure copper for high conductivity. These parts are reinforced with steel to increase the rigidity and strength of the frame. The holder handle is perforated with large holes to provide ventilation and reduce heating from induced currents when welding with alternating current.



Flame-washing torch for removing riser pads from castings made by National Cylinder Gas Co.



Hydraulic hose coupling and adapter union for high pressure brought out by the Eastman Mfg. Co.

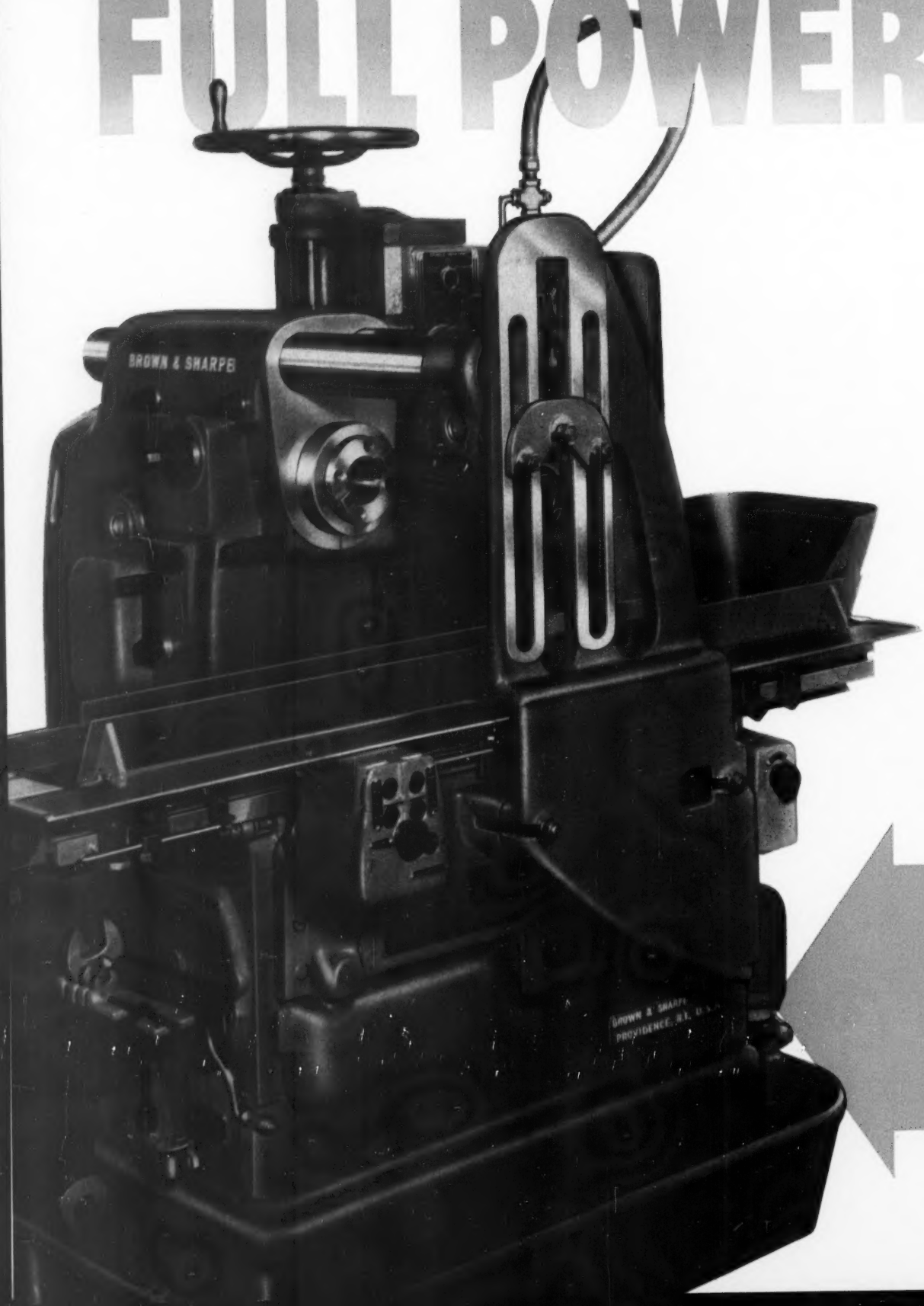


POWERFUL

No. 12 manufacturing type milling machine

Brown & Sharpe

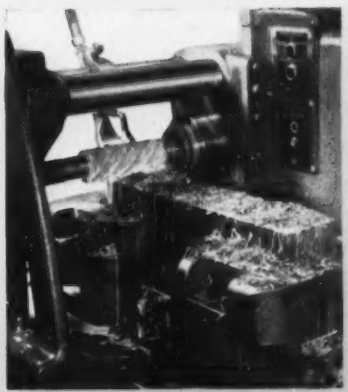
FULL POWER



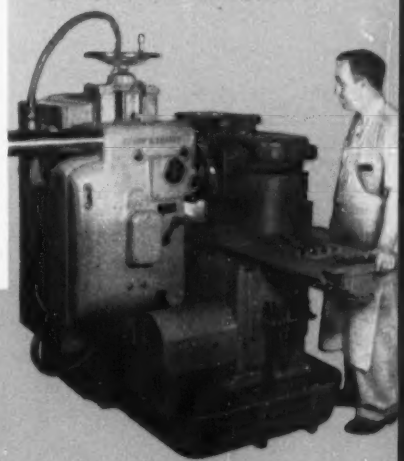
. . . 7½ h.p. at the spindle for extra fast milling on long and short run jobs

Through extra power and simplified operation, this machine gives you important competitive advantages for meeting today's high production schedules.

It allows you to take heavy cuts at fast feeds on a wide variety of medium sized work . . . quick set-ups are assured by many time-saving features. All power movements are electrically controlled giving you exceptionally precise, rapid operation. Dual feed rates, a variety of automatic cycles, and the ability to climb mill in either direction are just a few of its advanced conveniences. Maximum cutting efficiency is assured through a wide choice of feeds and speeds. Write for complete details on the powerful No. 12 Plain Milling Machine — 7½ H.P. Spindle Drive.



POWERFUL CUT being made on a No. 12, 7½ h.p. Milling Machine. Steel forging is 5" wide and cutter removes ¼" of stock at a fast feed. Unique high ratio gearing makes faster cutting possible.



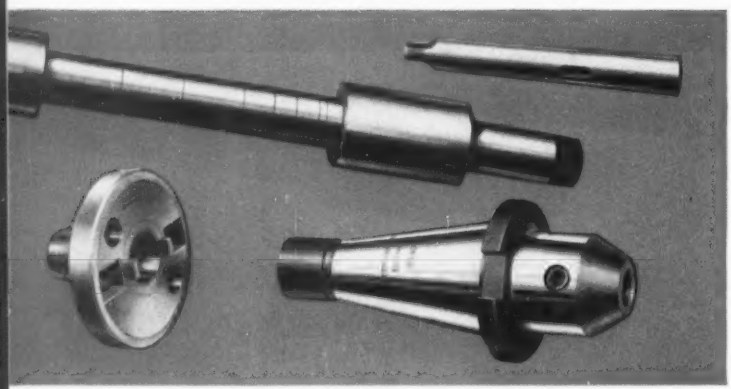
HIGH SPEED MILLING of casting using carbide-tipped face milling cutter. The powerful No. 12 permits taking full advantage of the faster feeds and speeds possible on medium-sized carbide milling jobs.

SPECIAL FIXTURES, like this for automatically indexing and milling squares on taps, make the No. 12 a still higher production machine . . . removal of fixture quickly converts machine for general use. Brown & Sharpe Engineering Service and Facilities are available to you for special applications.



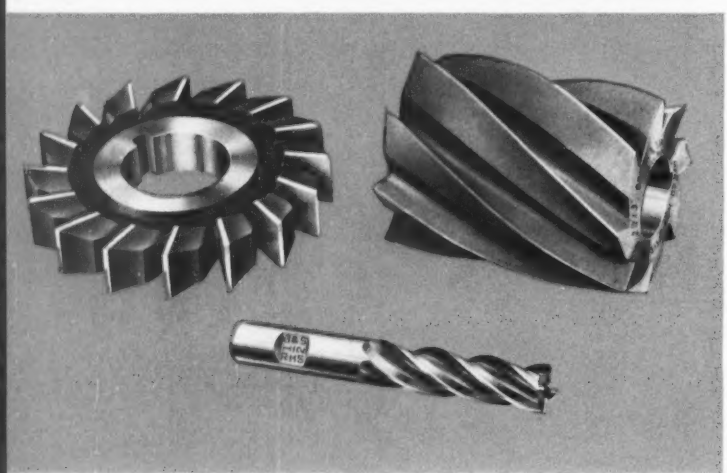
Brown & Sharpe

Keep Milling Efficiency High with these productioneered tools



ARBORS, ADAPTERS, and COLLETS

These arbors, adapters, and collets are made with the same precise care for which other Brown & Sharpe products are famous. Their strength and accurately ground surfaces insure highly efficient milling on all jobs.

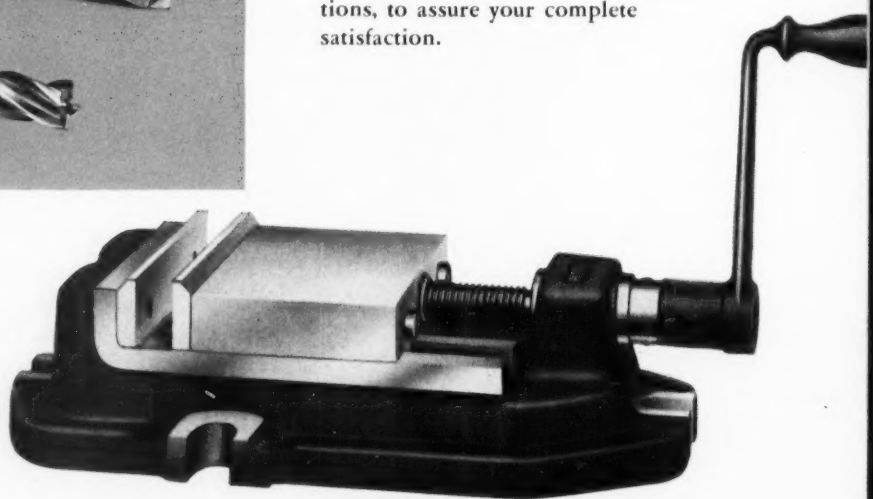


CUTTERS and END MILLS

Brown & Sharpe cutters give you full value for every dollar invested in them. That's why more buyers prefer them. They're made from the finest steels, under scientifically controlled conditions, to assure your complete satisfaction.

VISES

Low in height and rigidly constructed, these precision vises give you maximum work-holding economy. When fitted with special jaws, they often eliminate the need for expensive fixtures.



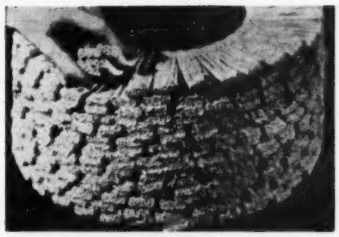
WRITE FOR COMPLETE INFORMATION ON ANY OF THE ABOVE PRODUCTS. BUY THROUGH YOUR LOCAL DISTRIBUTOR.

Brown & Sharpe

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

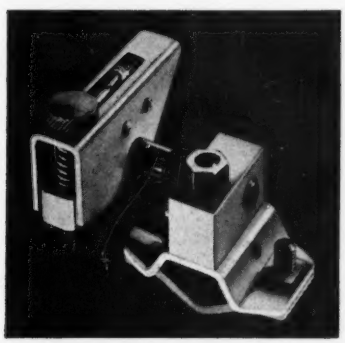
BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

PRINTED IN U.S.A.



Churchill Finger Type Sisal Buff

Finger type sisal buff marketed by the George R. Churchill Co., Inc., 7515 Fayette St., North Quincy 71, Mass. This flexible sisal buff is particularly adaptable for work involving curved surfaces and recesses. A specially processed, tightly twisted, sisal twine is used for the buff. This material is fabricated into each buff finger in such a manner that only the raw ends of the sisal fibers are in contact with the work. Hence cutting compounds are readily picked up and held, and the tough part of the sisal is the only part of the fiber that actually does the cutting. The 20-RD sisal buff is produced in sizes from 6 to 18 inches in diameter both for hand buffing and for various applications on automatic type buffing machines.

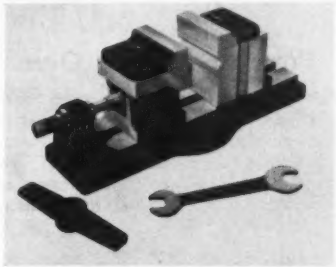


"Depthmaster" for Accurate Control of Bore Depth

"Depthmaster" bore depth control designed for use on any turret lathe, hand screw machine, or other machine tools where stops are employed. With this device bore depths can be held to a tolerance of 0.0001 inch in one operation. This control can be attached to the handwheel of any machine in one minute. It accurately and clearly records the exact amount of pressure exerted against the stop at all times, giving the operator complete and continuous control of his work down to the last thousandth of an inch. This depth control has been placed on the market by Pekay Steel Fabricators, 865 Sangamon St., Chicago 22, Ill.

Four-in-One Vise Reduces Set-Up Time

Versatile four-in one vise brought out by the Brown Engineering Co., Reading 2, Pa., to reduce set-up time and eliminate the need for jigs. This utility vise



is designed to save the time frequently lost in adjusting clamps, bolts, washers, parallel strips, levels, and squares ordinarily used for precision set-ups. It provides a simple, accurate means for handling a wide range of work on drill presses, millers, grinders, shapers, and other machine tools. The rear turret of the vise can be revolved or indexed to present four different faces for holding various kinds of work in vertical, horizontal, or angular positions. Auxiliary jaws at the top of each turret can be spread at an angle to hold odd-shaped work. Available in two sizes.

Electric Impact Wrench for Nuts and Bolts

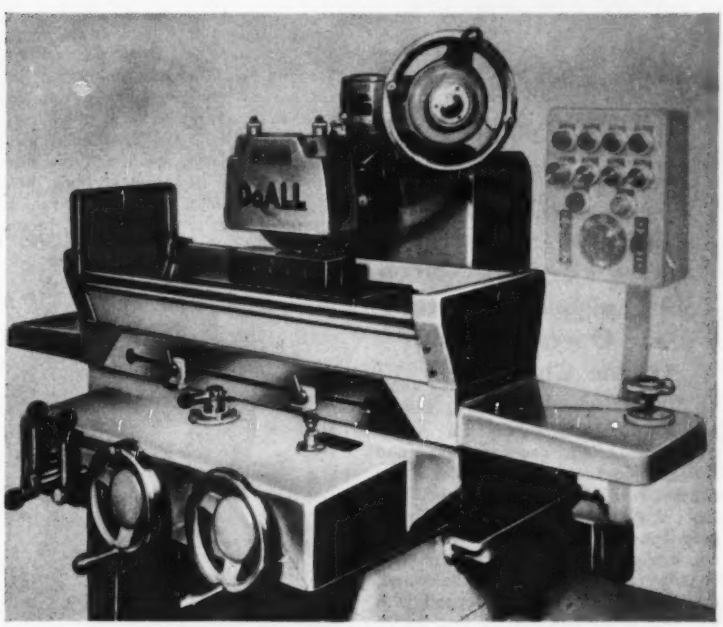
"Tork-Hammer" impact wrench now being marketed by the Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill. The housing of this wrench is of die-cast aluminum alloy. The pistol grip has a detachable side handle. There are a built-in trigger switch with locking pin, ball and needle bearings, heavy-duty gears, forced draft ventilation, and a heavy-duty, reversible, universal alternating- and direct-current, 115- or 230- volt motor. This wrench has a net weight of 16 3/4 pounds, and a free spindle speed of 1800

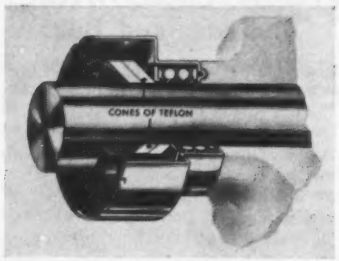


R.P.M. The hammer is mounted on an anti-friction bearing. The wrench handles up to 7/8-inch nuts and bolts.

DoAll Precision Surface Grinder

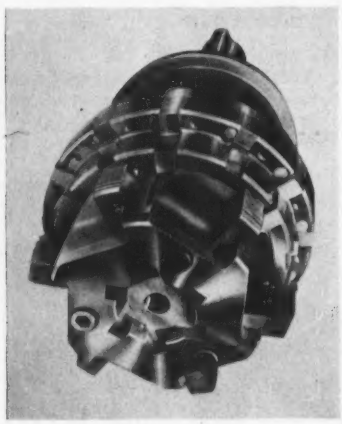
Precision surface grinder designated as tool room Model D6-1 to be exhibited and demonstrated at the forthcoming Western Metal Congress in Los Angeles, Calif., by the DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. The grinder has a radically new coolant system and new automatic controls. It is equipped with a variable cross-feed drive for use in wheel dressing, broach sharpening, etc.





Long-Life All-Purpose Shaft Seal

All-purpose mechanical seal announced by the Crane Packing Co., Department M-4, 1800 Cuyler Ave., Chicago 13, Ill. This seal, known as the "John Crane" Type 19, is said to provide life-time performance in small pumps, hot water circulators, and many other rotary shaft applications. Special beveled cones made of Teflon are utilized as the flexible member. This adapts the seal for services involving water, oil, corrosives, or acids at temperatures from — 100 to + 450 degrees F., vacuums and pressures up to 200 pounds per square inch, and high shaft speeds. It is available in sizes to fit shaft diameters of 1/4, 3/8, 1/2, 5/8, and 3/4 inch. The metallurgy of the seal (bronze, stainless steel, etc.) can be specified to meet requirements.

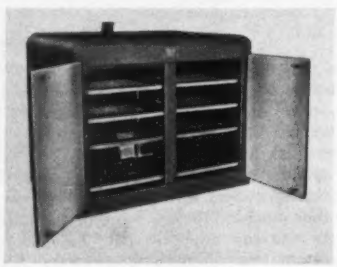


Tool Designed to Perform Four Operations with One Chucking

Special tool developed by the Landis Machine Co., Waynesboro, Pa., which combines boring, counterboring, and facing blades with conventional tap chasers in a 7-inch ALT tap head. This tool is designed to afford maximum production with reduction in handling cost and capital investments by making it possible for the work to be bored, counterbored, faced, and tapped with one chucking. The work is first bored, counterbored, and faced with the tap chasers collapsed. Upon completion of these operations the tool is withdrawn from the work and the tap chasers are expanded. The thread is then tapped on the surface previously bored. A lead screw feed is recommended for both boring and tapping operations to assure long tool life and fine finish.

Portable Heating Oven

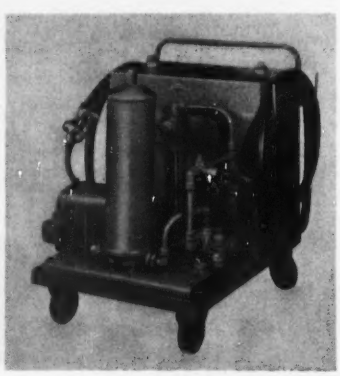
Portable enectric heating oven with eight compartments, recently added to the line of the Grieve Hendry Co., Inc., 1815 W. Lake St., Chicago 12, Ill. The compartments allow for separation of different sizes or types of products

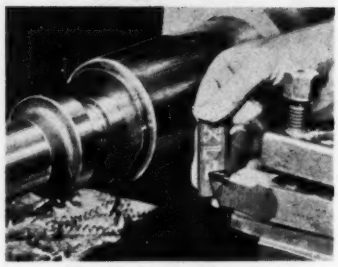


while drying, baking or preheating. Features include adjustable temperature control to 325 degrees F.; operation from 100 volt alternating-current outlet; fan-driven circulation of air to force out moisture; and adjustable damper for control of temperature. The oven is 30 inches wide by 25 inches deep by 24 inches high.

Portable Hydraulic Filter Unit

Portable hydraulic filter unit for pumping hydraulic oil from a machine, through the filter and back into the machine, or into tanks for transport or storage. The unit was built by J. N. Fauver Co., Inc., 49 W. Hancock, Detroit 1, Mich. It has a portable tank with 55- and 20-gallon sections, hose assemblies, pump, fittings and tubing, drip-proof nozzle, and 1/2-H.P. motor.





Hand Hone for Carbide Tools

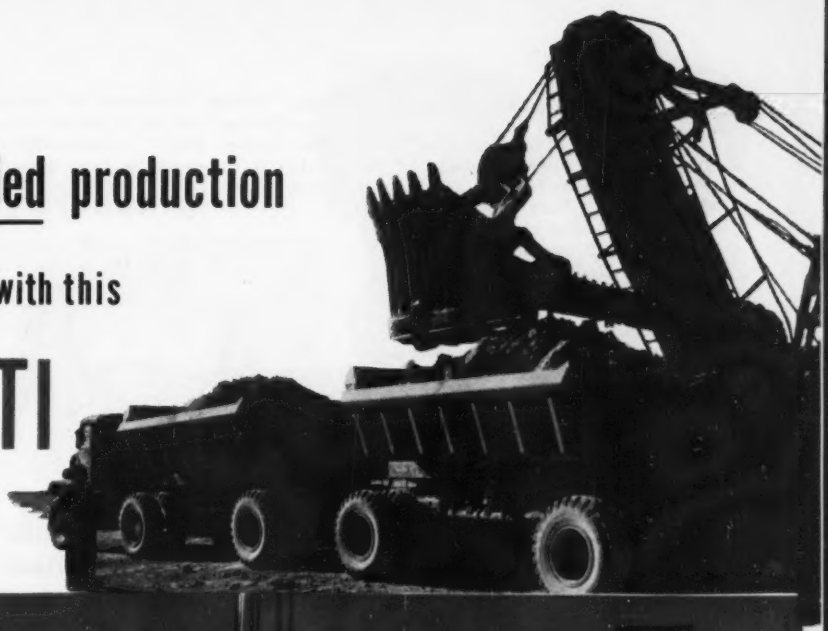
Silicon-carbide hand hone developed by the Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill., for sharpening single-point tungsten-carbide tools between grinds. As shown in the illustration, the hone can be used without removing the tool from its holder on the machine. Only a few light strokes of the hone over the tool edge are necessary, care being taken to hold the hone flat against the surface so as not to round the cutting edge or change the relief angle. When the tool eventually loses the original cutting angle, it is recommended that complete regrinding be employed.

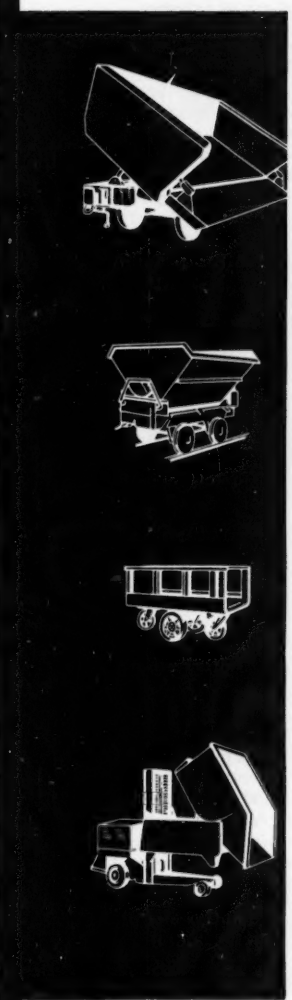


Instrument for Checking Wire-Drawing Dies

"AO Elder" die-angle scope, an optical instrument especially designed for measuring entrance angles of wire-drawing dies, announced by the American Optical Co., Instrument Division, Buffalo 15, N. Y. This instrument permits even unskilled operators, with only a few minutes of instruction, to read entrance angles to an accuracy of plus or minus 10 minutes of arc without damaging the die in any way. Multiple angles and poor polish are immediately detected with this instrument. Carbide wire-drawing dies from the largest down to dies as small as 0.005 inch can be accurately measured.

EASTON simplified production and improved product with this CINCINNATI Press Brake





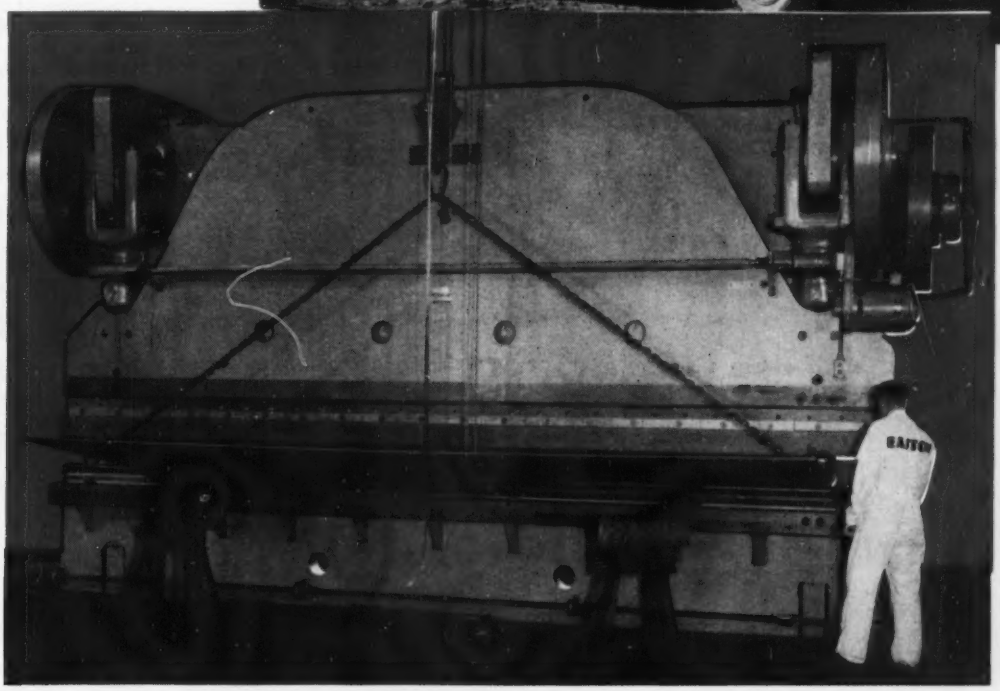


Illustration courtesy Easton Car & Construction Company, Easton, Pennsylvania.

Here a Cincinnati Press Brake is forming ½" plate for wide sections of off-highway trailers, at the Easton Car & Construction Company, makers of a large line of products for industrial transportation.

By using this Cincinnati Press Brake, some welding operations were eliminated, which improved the product, and reduced production costs at the same time.

The power, accuracy, and versatility of Cincinnati Press Brakes are reducing manufacturing costs where ever they are installed. If you form, or bend, you should investigate their possibilities.

Write for Press Brake Catalog B-3.

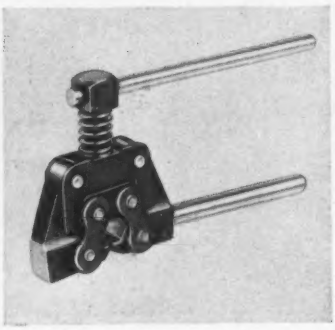
CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Chain-Breaking Tool

Chain-breaking or disconnecting tool, designated the CBT60, brought out by the Boston Gear Works, 14 Hayward St., Quincy 71, Mass. This tool will disconnect any roller chain manufactured according to specifications of the American Chain Manufacturers Association from 1/4 inch pitch up to and including 3/4 inch pitch. The roller link of the chain to be disconnected is inserted between the jaws of the tool. Then the adjustable lever is turned, forcing the pressing tip to push the pin through the link-plate. This process is

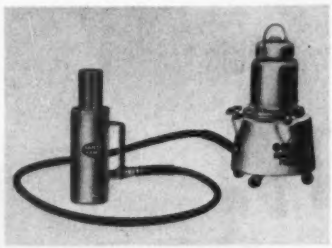


repeated on the pin at the other end of the same link-plate, thus disconnecting the chain.

Drill Press Clamp for Holding Odd-Shaped Parts

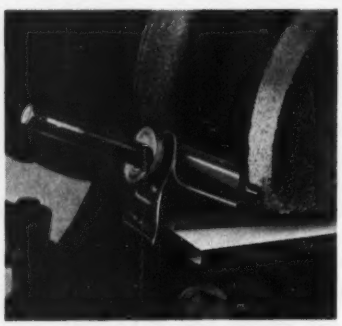
Drill press clamp known as the "Sta-Put" marketed by Clark & Sawyer, Inc., 2012 E. Seventh St., Los Angeles 21, Calif. Designed to fit current drill presses, the clamp is said to hold securely objects of virtually any shape for accurate drilling. It is attached on the drill press column, and can be swung to one side to permit setting up work for drilling. This clamp requires no C-clamps or V-blocks, and reduces breakage of drills by eliminating slipping. Tension is obtained by turning the adjusting knob on top of the clamp. The pressure fork is adjustable from 7 1/4 to 8 1/4 inches from the drill press column.





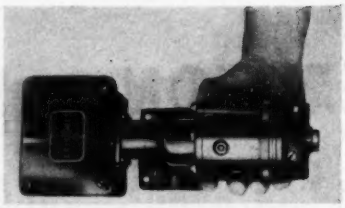
Air-Powered Hydraulic Pump and Safety Ram

Air-operated hydraulic pump requiring only a simple air line connection, designed for continuous service at maximum capacity without overheating or overloading, and safety ram designed to safeguard the operator and equipment at all times, even when fully extended. Smooth-acting hydraulic pressure ranging from 0 to 12,000 pounds per square inch is provided by the pump, which can be adapted to any hydraulic installations and the manually operated arbor presses. The ram is designed to unload itself automatically, preventing any possibility of plunger "pop-out." It is available in 20-, 35-, and 70-ton capacities. These Ohio pumps and safety rams are manufactured by Powermatic, Inc., 1944 E. Market St., Akron 5, Ohio.



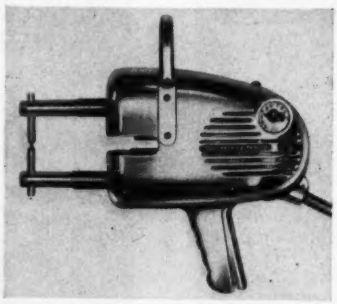
"Dymondcut" Wheel Dresser

Grinding wheel dressing tool, known as the "Dymondcut," introduced by Hazerodt Associates, 416 Ford Building, Detroit 26, Mich. Simple construction, efficiency, versatility, and low cost are the outstanding features claimed for this tool. The dresser is designed for use on pedestal, hand, surface, disc, and tool-room grinders. It can be used also for either angle or side dressing and is recommended for wheels up to 10 inches in diameter.



Miniature Pneumatic Transmitter

Miniature pneumatic transmitter placed on the market by the Bristol Co., Waterbury 20, Conn., for measuring and transmitting readings of temperature, pressure, vacuum, differential pressure, and liquid level to recording, indicating, and controlling receivers, including miniature type receivers. Transmission is by means of air pressures of between 3 and 15 pounds per square inch that have a direct relationship to the measured quantity. This new type of pneumatic transmitter, known as Series 650, uses standard Bristol measuring elements and a simple transmitting mechanism that is sensitive to extremely small changes in the measured value—as little as 0.03 per cent of the range.



Portable Spot Welder with Time Control

Spot welder of the portable type with built-in electronic-controlled timer switch now being marketed by the Ross Machine Tool Co., 7631 S. Ashland Ave., Chicago 20, Ill. Any timing cycle from one-sixtieth second to a full second is obtained by simply setting a switch. The electronic controls, together with a transformer suspended for quick heat dissipation, are contained in an aluminum housing. This is claimed to be the first portable tool that will weld most aluminum-alloy sheets, as well as mild, stainless, galvanized, and cadmium-plated steel and other metals, up to a combined thickness of 3/16 inch. Accurately timed welds can be made as fast as the operator can squeeze the pistol grip. The 26-pound welder operates on 220-240 volt 60-cycle alternating current, and develops electrode pressures up to 1000 pounds and an amperage of over 12,000

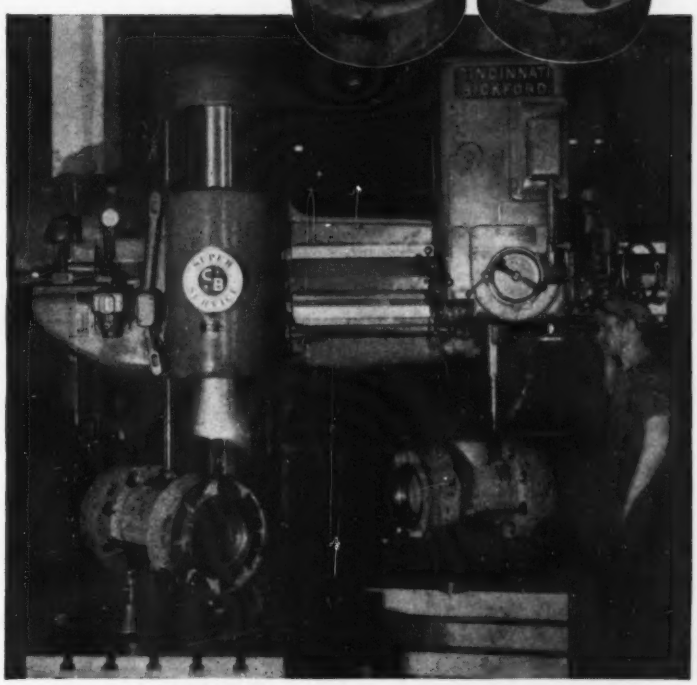
saving 2½ hours per piece.....



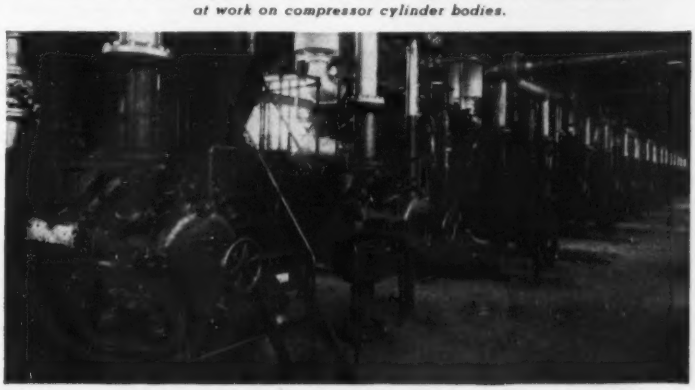
Profitable experience brings satisfaction—and so you find 33 Cincinnati Bickford Drills of all types at the Grove City plant and 20 at the Mt. Vernon plant of The Cooper-Bessemer Corporation.

In the steel compressor bodies shown, and in the front and rear heads which involve similar drilling operations, $1\frac{3}{8}$", $2\frac{3}{32}$", and $2\frac{9}{16}$" holes are bored with a time saving over a previous machine of 2½ hours, floor to floor per unit.

Handling time was much reduced, and the outstanding convenience and ease of control, combined with steady, accurate performance and dependability, effect these marked operating savings.



One of the battery of Cincinnati Bickford Super Service Radial Drills at work on compressor cylinder bodies.



Ten Cooper-Bessemer Type GMV six-cylinder gas engines of The Cooper-Bessemer Corporation at work in a large Canadian oil company plant. A Cincinnati Bickford Super Service Radial worked on these compressor cylinders.

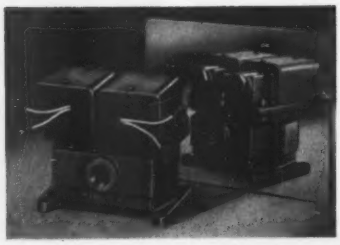
CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.

at the welding point. The standard model has a throat depth of 7 inches but throat depths up to 18 inches are available.



Air Valve Designed to Make Repeat Strokes of Press Impossible

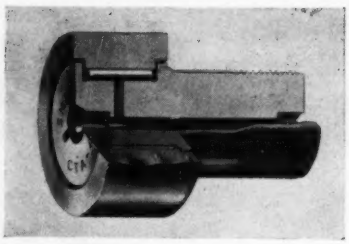
The Hannifin Corporation, 1110 S. Kilbourn Ave., Chicago 24, Ill., has just announced this special air control valve which is designed to make practically impossible "repeat" strokes due to valve failure on mechanical presses controlled by air-operated clutches and brakes. This series BB-5 is the latest addition to the line of "Pilot-Master" valves and is a dual three-way valve, there being actually two three-way solenoid-operated valves in parallel in one compact body. Both valves must operate to start the press, but if for any reason only one valve reverses, the unit "fails safe" and the press stops. The valve is offered only in 3/4-inch pipe size.

Perkin-Elmer Auto-Collimator

"Jackknife" auto-collimator for the precise measurement of angles, parallelism, and surface quality of metals, plastic, or glass, now available from the Perkin-Elmer Corporation, Norwalk, Conn. This collimator can be used in routine machine and optical shop operations for work requiring an accuracy



greater than 6 seconds (0.002 degree). No special operating skill is needed. The collimator is used directly against any surface reflecting a light beam.



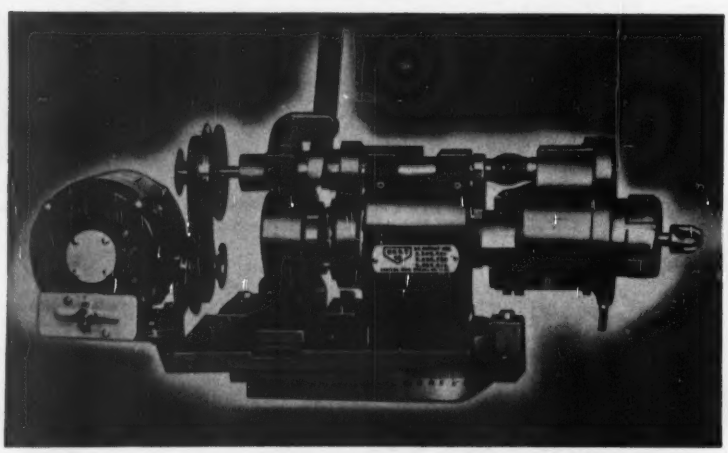
Cam Follower Roller

Cam follower roller designed to meet heavy-duty requirements. Because of an integral flange on the stud, it is possible to increase the stud diameter up to 100 per cent of the conventional size. This assures the unusual strength demanded in special applications where high speed and heavy load-carrying capacity are essential. The stud is case-hardened in the bearing section, but left soft on the threaded end to prevent snapping under impact or pressure. Threads are precision machined to assure proper fit of the nut. Made by Smith Bearing Co., 12 Bear Tavern Road, West Trenton, N. J.

"Circularity" Grinding Attachment

Model 500 "circularity" grinding attachment developed by the Detroit Reamer & Tool Co., 2830 E. Seven Mile Road, Detroit, Mich. The motor-driven attachment simultaneously revolves the work to be ground and moves it longitudinally back and forth. These movements are the result of a direct gear drive to the collet housing gear and spacer gear. Standard spacer gears with a follower pin for each flute to be ground provide indexing for two, three, four, six, eight, or twelve flutes. Special spacer gears can be provided when the number of flutes is outside those listed. The number of back and forth movements per revolution of work is controlled by the number of follower pins used in the spacer gear. Simple set-ups permit fast and easy grinding of form relief, radial relief and tapered and straight cylindrical work.





Welder's Helmet with Variable Shade Lens

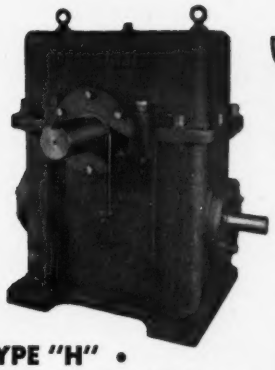
All-shade welder's helmet attachment introduced under the name "Vari-Shade," and manufactured by Polacoat Inc., 9822 Conklin Road, Blue Ash (Greater Cincinnati), Ohio. Designed to fit all standard welders' helmets, the unit gives complete protection in shades from 6 to 12, eliminating the necessity of changing lenses with varying work. It is particularly useful in starting and welding on close work where it is desirable to see the parts being welded without running the risk of burns or eye damage with the hood up. After the arc is struck, a flick of the hand turns attachment to higher intensity. Furnished with 1000-hour cover lens.

D. O. James

ESTABLISHED 1888

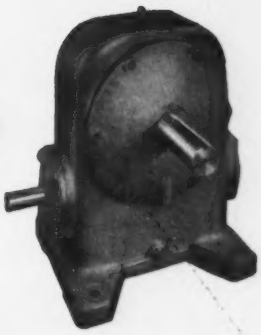
for the Best in

WORM GEARS AND WORM GEAR REDUCERS



TYPE "H" •

Horizontal or Vertical Drive—Each drive type comes in 15 sizes, with ratio ranges of 5.6:1 to 100:1 and from .06 to 206 horsepower.



TYPE "S" •

Horizontal or Vertical Drive—Each type available in 8 sizes, ratio range of 5.66:1 to 100:1 and from .04 to 15.6 horsepower.

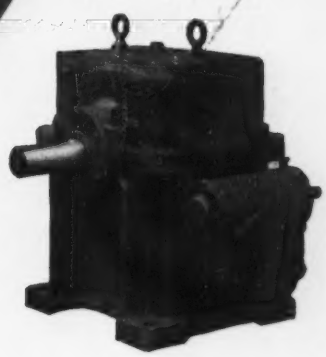
MOTORIZED •

Horizontal or Vertical Drive—Each drive type comes in 11 sizes, has ratio range of 5.6:1 to 100:1, with ⅛ to 30 horsepower, driven speeds of 310 r.p.m. to 17.4 r.p.m. Vertical drive slow speed shaft extends either upward or downward.



DOUBLE •

Horizontal or Vertical Drive—Each drive type available in 13 sizes, ratio range of 130:1 to 10000 and from .004 to 59.7 horsepower. Vertical drive slow speed shaft extends either upward or downward.



WORM GEARS

Generated on tangential feed hobbing machines by tapered and ground hobs. Made from 1" to 100" in diameter and from 24 DP to 1 DP.



Catalogs are available to users of Gears and Gear Reducers—containing valuable engineering data, specifications, weights and prices.

Send for Catalogs 45-B and 45-C for Complete Information on Worm Gear Reducers



D. O. JAMES Worm Gears and Worm Gear Reducers are designed and manufactured to have maximum inbuilt strength and to assure dependable *on-the-job* performance. The many and repeated installations of these reducers testify to their operating superiority and adaptability.

D. O. James GEAR MANUFACTURING COMPANY

1140 WEST MONROE STREET • CHICAGO, ILLINOIS

SINCE 1888—MAKERS OF ALL TYPES OF GEARS AND GEAR SPEED REDUCERS

Mills, Drills, Spotfaces and Taps Bearing Blocks

(1200 pieces per hour)

Another Transfer-matic by Cross





- ★ Drills and spotfaces stud holes; drills angular oil hole; drills and taps two screw holes; mills bearing lock slots; and saws into five individual pieces.
- ★ 240 bearing block sets (1200 pieces) per hour at 100% efficiency.
- ★ Capacity for machining two sets of parts at a time.
- ★ Two heavy-duty, 25 hp, vee belt drive, milling spindles for sawing operations.
- ★ Other features: Built-in chip conveyor, automatic lubrication, overhead transfer mechanism, gravity operated cam clamping for work holding fixtures, J.I.C. hydraulic and electrical construction.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS



Between Grinds

By E. S. Salichs

Aero's Alchemy

The first 1953 Aero Willys had chromium "W" emblems on them, but now can be substituted by gold-colored emblems in celebration of the company's fiftieth birthday. The publicity release was somewhat confusing in its summary of the situation: "Willys dealers are now prepared to replace the chromium insignias without charge and at the minimum cost."

The Plane That Went Underground

The fate of the Wright brothers' Flyer—smashed in 1903 and packed in pieces in three crates and a barrel—was outlined in *The Beehive* (United Aircraft Corporation's quarterly). Orville Wright restored the historic plane twenty-five years later, complete with engine, shipping it for exhibition in London's South Kensington Science Museum. During the war it was removed for safety, first to a subway and later to a Welsh coal mine. In 1948, the Kitty Hawk Flyer settled down at the Smithsonian Institution in Washington, D. C.

Scissors Cut Up

Now there's a pair of scissors on the market with eighteen separate uses, so they say. After you have exhausted its possibilities for cutting your cigars, filing your nails, driving a screw, extracting a cartridge, measuring off a piece of glass, and then cutting it, for some light entertainment you gaze through the shank to marvel at five stereoscopic views of New York City.

Jet Bird Pops Out of Steel Shell

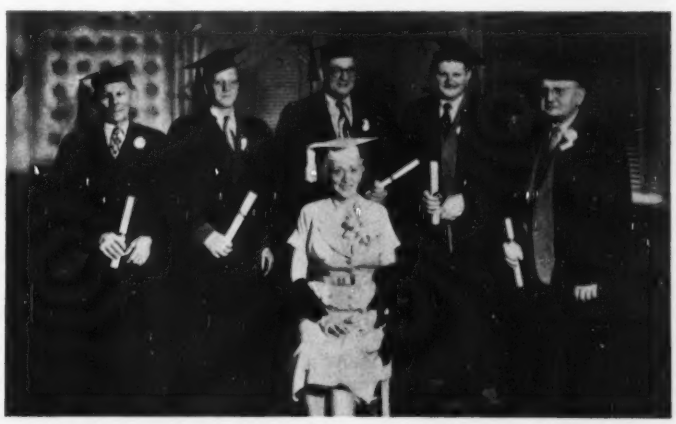
At the Marine Corps Air Station at Cherry Point, N. C., there is a diamond-shaped airplane hangar that pulls apart at the flip of a switch, *Steelways* reports. The "pull-apart" hangar is made of two 58-ton triangular steel shells mounted on wheels running on tracks.

Need a Slot Cleaner?

The best machine tool slot cleaners in life are free—simply send your request on a company letterhead to the Dayton Rogers Mfg. Co., Minneapolis 7, Minn. The slot cleaner is made of 1/8-inch cold-rolled strip steel, rustproofed. No need to cut out box tops, sign away your social security, or supply 10,000 friends' names. So be keen if you have a slot to clean.

And No Light Touch

We read recently that the word *tax* is from the Latin *taxare*—meaning "to touch sharply." Adding the phrase "in March" is simply a local interpretation of the meaning, anent American experience.



Five new members of the Quarter Century Club of the Cleveland Punch & Shear Works Co. were welcomed by Mrs. Florence Sayle, company president, in a simulated graduation ceremony at the annual meeting of the Club. The newcomers (having been with the company for twenty-five years now) surrounding Mrs. Sayle are F. Bey, S. Kusmer, W. Kromer, J. Jaklitsch and A. Skodis. We can visualize a domestic scene prior to this event in which Dad made a deal with Sonny, a scholastic senior, swapping his tuxedo for the loan of a cap and gown!

News OF THE INDUSTRY

California

STANDARD PRESSED STEEL CO., Jenkintown, Pa., has opened a warehouse at 815 N. Sepulveda Blvd., El Segundo, Los Angeles, Calif. The warehouse contains some 3500 square feet of floor space, and will service California, New Mexico, Arizona, Colorado, Idaho, Montana, Wyoming, Nevada, Utah, Washington, Oregon, and British Columbia.

G. W. GILLILAND, sales representative at Los Angeles, Calif., for Joseph T. Ryerson & Son, Inc., Chicago, Ill., for the last nine years, has been named manager of the sheet and strip department in the Los Angeles steel service plant. A modern mill type slitter was recently placed in operation at this plant.

JOHN H. READ has joined the Axelson Mfg. Co., Division of Pressed Steel Car Co., Los Angeles, Calif. He will work on the company's advertising and sales promotion program.

Connecticut

ALEXANDER B. FREEMAN general manager of the American Metal Hose Branch of the American Brass Co., Waterbury, Conn., has been promoted to the position of vice-president. Mr. Freeman became associated with the company in 1912. In 1918, he was made western sales manager at Chicago, Ill., and returned to Waterbury in 1950 to become general manager.



Alexander B. Freeman, vice-president of the American Brass Co., American Metal Hose Branch

JOSEPH T. VINBURY, advertising manager of the New Britain-Gridley Division, New Britain Machine Co., New Britain, Conn., has been appointed chairman of the Advertising Committee of the National Machine Tool Builders' Association for the coming year. Mr. Vinbury succeeds FRANK PENSINGER of the Monarch Machine Co., Sidney, Ohio, who was chairman of that Committee for the last two years.

SKINNER CHUCK CO. has recently completed a new plant at Edgewood Ave., New Britain, Conn., which comprises 85,000 square feet of floor space, with all modern facilities for the production of lathe chucks and machine vises for machine tools and solenoid-operated valves. The building will be occupied by both the Skinner Chuck Co. and the Skinner Electric Valve Division.

WARREN E. HILL has joined the Emhart Mfg. Co. in the capacity of vice-president in charge of operations, a new post. Mr. Hill's activities will be with all Emhart operating units, which include the Henry & Wright Division, Hartford, Conn.; V & O Press Co., Hudson, N. Y.; and Hartford-Empire, Hartford.

WILBUR C. STAUBLE, executive vice-president, was recently elected president and chief executive officer of the Holo-Krome Screw Corporation, Hartford, Conn. He was one of the founders of the concern in 1929.

Indiana, Illinois, and Missouri

AMERICAN WHEELABRATOR & EQUIPMENT CORPORATION, Mishawaka, Ind., has just completed construction of a plant specially designed for the manufacture of Wheelabrator steel shot, a blast-cleaning abrasive.

GEORGE S. BOND, chief engineer of the Metals and Ceramics Division of P. R. Mallory & Co., Inc., Indianapolis, Ind., has been promoted to sales manager of this Division.

EDWARD VALVES, INC., subsidiary of the Rockwell Mfg. Co., has opened a new engineering building at East Chicago, Ind., adjacent to its research laboratories.



J. C. Kuhn, new vice-president of sales at the Atkins Saw Division of Borg-Warner Corporation

J. C. KUHN was recently appointed vice-president, sales, of the Atkins Saw Division of the Borg-Warner Corporation, Indianapolis, Ind. Mr. Kuhn was formerly vice-president and director of sales of the Morse Twist Drill & Machine Co., New Bedford, Mass.

LOGAN ENGINEERING CO., Chicago, Ill., has announced its entry into the field of hydraulic press manufacturing. The presses will be custom engineered, and will have a pressure range of from 20 to 400 tons. They are designed primarily for plastic and rubber molding, but can be adapted for widespread industrial use. The company is also preparing a line of standardized small presses for general industry.

RAY P. JOHNSON has been appointed director of sales research for the Borg-Warner Corporation, Chicago, Ill., while ALONZO B. KIGHT has been made administrative assistant to the president. Also announced was the election of D. MORRIS PRATT to the vice-presidency of the Marbon Corporation, a subsidiary of Borg-Warner at Gary, Ind.

CARL E. SCHMITZ, vice-president and director of engineering for the Crane Packing Co., Chicago, Ill., was recently made vice-president in charge of sales. Another appointment announced by the company was that of

ANNOUNCING 4 NEW CUTTING OILS!

2 DUAL-PURPOSE OILS (lubrication and cutting)

SUNICUT 11-S for medium duty on automatic screw machines

SUNICUT 209-S for heavy duty on automatic screw machines

2 SINGLE-PURPOSE OILS (cutting only)

SUNICUT 102-S for heavy duty on automatic screw machines

SUNICUT 110-S for heavy duty service in broaching, threading, gear cutting, heading and similar applications

All four oils keep parts and tools cooler, help maintain closer work tolerances, permit longer runs between tool dressings. All are odorless and light in color. In addition, Sunicut 11-S and 209-S have high lubricating value and are nonstaining.

For your copies of the technical bulletins describing these new oils, call the nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-3.



INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

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A. J. SOLARI to the position of chief engineer, Mechanical Seal Division.

ROBERT P. MELIUS has been named merchandising manager by the Skil Corporation, Chicago, Ill., manufacturer of portable electric and pneumatic tools. Mr. Melius replaces WILLIAM FERRY, who has been made industrial sales manager.

JOHN H. PHELAN has been appointed midwestern sales engineer for the Aget-Detroit Co., Ann Arbor, Mich., manufacturer of industrial dust and vapor control equipment. His headquarters will be in Chicago, Ill.

FRANK E. GOLLIHER has been named manager of the General Electric plastics molding plant at Decatur, Ill., by the General Electric Co. He replaces HENRY SEMLER, plant manager since 1950, who has now been transferred to the staff of the company's plastics department.

WALTER A. MEYER has joined the Furnas Electric Co., Batavia, Ill., manufacturer of electric motor controls, in the capacity of general sales manager.

THEODORE V. PURVIN has been named general sales manager of Amgears, Inc., Chicago, Ill. Mr. Purvin has spent some sixteen years in the gear and related industries.

T. V. PICRAUX, sales manager of the Industrial Division for the Lincoln Engineering Co., St. Louis, Mo., has been promoted to the post of production manager of both the company's plants. ALBERT J. GRUENEWALD succeeds Mr. Picraux in the vacated position. ROBERT E. REDENBAUGH has been appointed manager of the Original Equipment Division.

Massachusetts and Rhode Island

DR. BRIAN O'BRIEN was recently appointed vice-president in charge of research of the American Optical Co., Southbridge, Mass. Dr. O'Brien, a director of the Institute of Optics and a research professor of physics and optics at the University of Rochester, has taken a leave of absence. In his new association, Dr. O'Brien will direct a research program in all phases of optics and their application to the products of the company.

SOLAR STEEL CORPORATION, Cleveland, Ohio, recently purchased UNITED STEEL PRODUCTS, INC., Worcester, Mass., thus increasing its facilities for distributing general steel products. The newly acquired plant has the latest processing equipment for handling flat rolled and bar and tube steel products to exact specifications.





(Left) John Jeppson, vice-president of the Norton Co. and works manager of the Abrasive Division. (Right) A. Donald Kelso, vice-president in charge of foreign operations and president of Norton Behr-Manning Overseas Inc.

NORTON CO., Worcester, Mass., announces the following promotions: JOHN JEPPSON, formerly assistant secretary and works manager, has been appointed a vice-president, remaining as works manager of the Abrasive Division also; A. DONALD KELSO, president of Norton Behr-Manning Overseas, Inc., since last October, has become a vice-president in charge of foreign operations and a director, retaining his presidential post as well; HOWARD J. DALY, manager of the Bauxite and Crude Abrasive plants, has been elected to the board of directors; and RICHARD PROUTY, who was assistant to the treasurer, has been made assistant secretary of the company.

ARTHUR E. JAMIESON is being made sales manager by the S. W. Card Mfg. Co., Mansfield, Mass. Mr. Jamieson, who will now be in Mansfield, was formerly in charge of Ohio and Pennsylvania sales, with headquarters in Cleveland, Ohio. RUSSELL L. DICKSON will replace him.

ELDEN L. AUKER, district manager at Detroit, Mich., for the Bay State Abrasive Products Co., Westboro, Mass., has been promoted to the position of sales manager. He succeeds E. HALSEY BRISTER, who has been named director of product development and quality control.

NORTON CO., Worcester, Mass., is announcing several new appointments in the sales force: WARREN R. SPOFFORD, abrasive engineer who handled Worcester County, will take over a new metropolitan Boston territory as a result of the resignation of RAYMOND J. FORKEY, who was formerly abrasive engineer in eastern Massachusetts; SIDNEY B. WETHERHEAD, abrasive engineer who assisted Mr. Forkey, will now assume complete responsibility for his territory, excluding the Boston area; and GORDON T. RIDEOUT will replace Mr. Spofford in Worcester County, while the position he vacated — sales engineer in the sales engineering department at Worcester — will be filled by EVAN C. LUCE, who was grinding engineer in that department. DAVID H. PAUL has been appointed field engineer in the Philadelphia, Pa., district, having recently returned to the company after a period of service with the U. S. Navy.

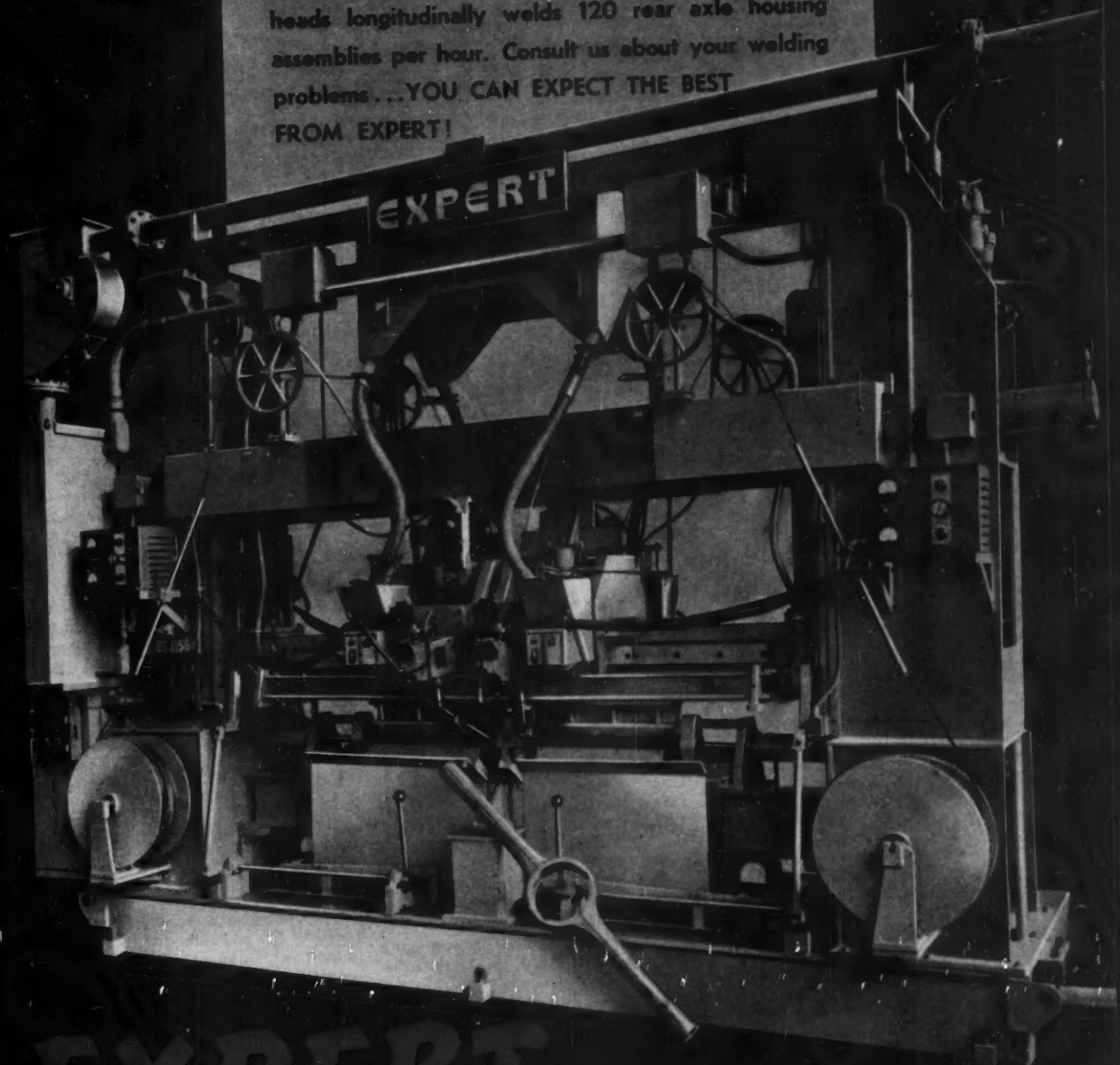
WILLIAM G. FIENEMANN has been made assistant sales manager of the Worcester Pressed Steel Co., Worcester, Mass., and will also continue to carry on his duties as product development manager. JOHN E. KING has been appointed assistant to the sales manager.

LANGDON M. PHILLIPS has been promoted to the position of assistant sales manager of the Rodney Hunt Machine Co., Orange, Mass. Mr. Phillips was formerly a field sales manager. Also announced was the appointment of JACK W. REMBE as sales manager. Mr. Rembe, who has been export manager for the last five years, will now direct sales activities in the company's five product divisions in both domestic and export markets.

F. STEELE BLACKALL, III, has been appointed assistant general manager of the Taft-Peirce Mfg. Co., Woonsocket, R. I., producer of machinery and tools. Mr. Blackall is also assistant treasurer and a director of the company. For some time past, until his present promotion, he served as assistant superintendent of the contract division. Also announced was the promotion of JESSE E. DEACON to the position of assistant

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F. Steele Blackall III, assistant general manager of the Taft-Peirce Mfg. Co.

superintendent of the contract division. He has been general foreman of the propeller shaft department for the last two years. RUSSELL W. GRABINSKY will replace Mr. Deacon in that capacity.

Michigan

WILLIAM A. REICH has been appointed manager of advance development engineering at the Carboloy Department of General Electric Co., Detroit, Mich. For the last seven years, Mr. Reich was engineer in charge of the metallurgy section of the Turbine Division Laboratory of the General Electric Co. in Schenectady, N. Y. Also announced was the appointment of HERBERT E. FENTON as mining sales and service engineer in the Pittsburgh, Pa., area.

MODERN ENGINEERING SERVICE CO., Berkley, Mich., has purchased a completely equipped new plant located at 22525 Hoover Road, Van Dyke, Mich. The plant consists of 8000 square feet of manufacturing area, and will be operated by SAM PASUTIN. Mr. Pasutin was formerly a tool engineer and consultant with the company.

O & S BEARING CO., Detroit, Mich. and its subsidiary, the NEVEROIL PRODUCTS CO., Whitmore Lake, Mich., have consolidated, and will be known as the O & S BEARING & MFG. CO. The Detroit company is moving to Whitmore Lake, at 777 W. 8 Mile Road.

DETROIT HARVESTER CO., Detroit, Mich., has annnounced the purchase of the PIONEER PUMP & MFG. CO., also of Detroit. The Pioneer concern has produced coolant and lubrication pumps, largely for the machine tool industry, for twenty-two years.

BURTON ZOOK was recently appointed sales manager for the Jensen line of industrial ovens and heating equipment by Jensen Specialties, Inc., Detroit, Mich. Mr. Zook has been a sales engineer with the company for the last seven years.

WICKMAN MFG. CO. announces the completion of its new factory located at 10325 Capital Ave., Detroit, Mich. The company manufactures diamond wheels and drills, bench grinders, reamers, and tapping attachments.

GEORGE J. FISCHER, general sales manager of the Aeroquip Corporation, Jackson, Mich., has been elected vice-president of sales, while MATTHEW J. BETLEY, works manager, has been made vice-president of manufacturing.

TURCHAN FOLLOWER MACHINE CO., Detroit, Mich., announces the following promotions: GALE S. HUMES, general manager; OTTO C. TURCHAN, sales manager; and DEMETER KIURSKI, chief engineer.

New York and New Jersey

GENERAL ELECTRIC CO., Schenectady, N. Y., announces that its Small and Medium Motor Department has been discontinued, its operation having been decentralized into four new product organizations: Medium Induction Motor Department, with OLAF F. VEA as general manager; Direct-Current Motor and Generator Planning Study, with OSCAR L. DUNN as manager; and Synchronous and Specialty Motor and Generator Department, with FRED B. HORNBY as general manager. Headquarters for the first two departments will be at Schenectady, and for the third at Lynn, Mass. The fourth department, to be known as the marketing department, has been established in Schenectady, with WALKER H. HENRY as manager. These four product departments now comprise the Motor and Generator Division.

TRUFANT FOSTER has been made trade sales representative to bookstores in the United States by THE INDUSTRIAL PRESS, New York City, publisher of MACHINERY, MACHINERY'S HANDBOOK, and other engineering books. Prior to forming his own company in 1951, Mr. Foster was a technical sales representative for a large book company. The company he organized, Technical Book Sales Associates, also of New York City, represents several publishers and constitutes a technical book sales service.

BRITISH INDUSTRIES CORPORATION, New York City, has been appointed American distributor for the machine tools, accessories, and parts produced by H. W. KEARNS & CO. LTD., Manchester, England, specialist in the manufacture of horizontal boring machines.

FONDA GAGE CO., INC., Stamford, Conn., announces that company sales will now be made through the FONDA GAGE SALES CORPORATION, 38 Broad St., Port Chester, N. Y. ROBERT A. MANES, who was sales manager of the Fonda Gage Co., will be president of the new corporation.

JAMES M. DEHN has joined the engineering staff of Peter A. Frasse & Co., Inc., New York City. Mr. Dehn has been associated with the steel industry for over twelve years as a stainless steel specialist.

JAMES M. WHITE has joined the American Car and Foundry Co., New York City, assuming the position of vice-president. He succeeds ROBERT W. WARD, who has retired after forty-two years with the company.

JOHN H. FASSETT, manager of the Clutch Division, Hilliard Corporation, Elmira, N. Y., was recently elected a vice-president of the corporation. He will continue his duties as manager of the Division.

HENRY F. MCKENNEY has been appointed chief engineer of the Ford Instrument Co., Division of the Sperry Corporation, Long Island City, N. Y. Prior to his promotion, Mr. McKenney was assistant chief engineer.

JAMES W. MURPHY has been made manager of sales, Stainless and Alloy Castings Division, by the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Mr. Murphy will be located at Buffalo, N. Y.

GILFRY WARD has been appointed president and JOSEPH L. MULLIN, first vice-president, of the American Manganese Steel Division of the American Brake Shoe Co., New York City.

JOHN E. OSMANSKI has joined the Crucible Steel Co. of America, New York City, in the capacity of supervisor of training.

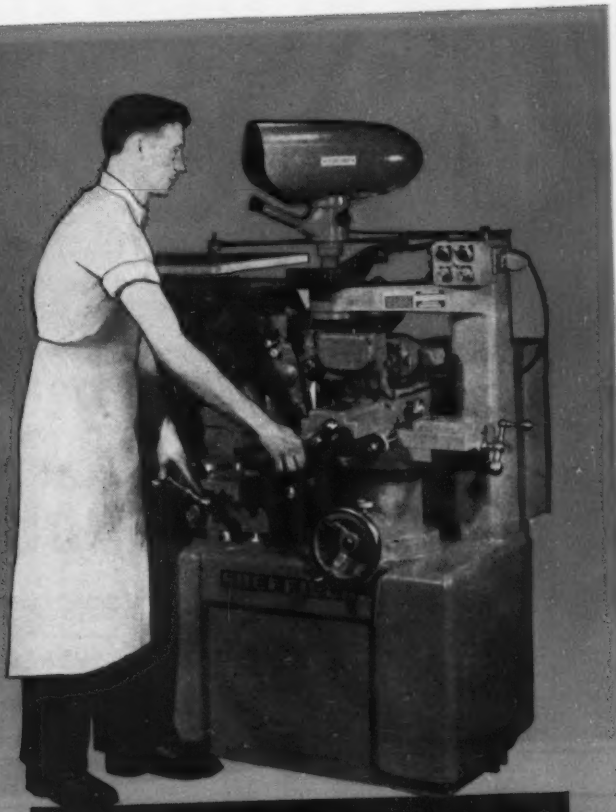
FRED RIMMLER has been made plant manager of John Volkert Metal Stampings, Inc., Queens Village, N. Y.

WALKER-TURNER DIVISION, KEARNEY & TRECKER CORPORATION, recently completed an addition to its present plant in Plainfield, N. J., and celebrated the occasion with an open house. Improved production line techniques have been instituted in the new plant set-up.

SERVICE MACHINE CO., Elizabeth, N. J., announces the completion of a new plant for general tooling and

(This section continued on page 245)

Grind High Precision Profiles Directly from the Drawing *with* SHEFFIELD'S MICRO-FORM GRINDER





Features

- Grinds both flat and circular profiles
- No restrictions on profile intricacy
- No templates needed
- Perfect toolroom accuracy
- Saves up to 75% on profile work
- Final accuracy checked while work is still on the grinder
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- Grinds any material including carbides
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For full details and specifications ask your Sheffield representative for Bulletin MFG-122-51 or write us direct.



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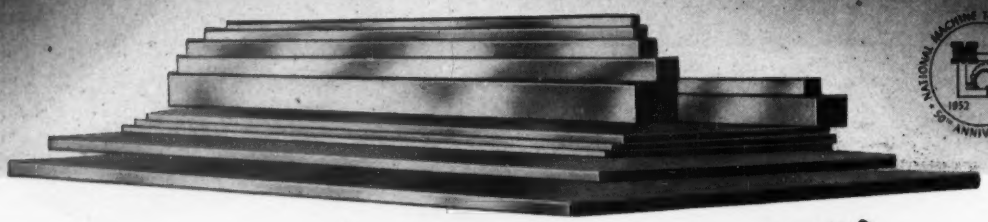
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New Starrett *Air Hardening* Die Stock is non-deforming . . . no distortion, no cracking, no costly rejects, less finish grinding. It's fully spheroidized annealed for easy machining with a wide hardening range for foolproof heat treating. Order a supply today through your distributor. He'll give you prompt, dependable, quality service.

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4 TYPES—295 SIZES

NO. 497 AIR HARDENING
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NO. 495 OIL OR WATER HARDENING
NO. 495 WATER HARDENING

Flat stock in 18″ lengths, die stock in 36″ lengths. Thicknesses from 1/64″ to 3″—widths from ⅛″ to 14″. Each piece marked for size and type and packaged in protective envelope.



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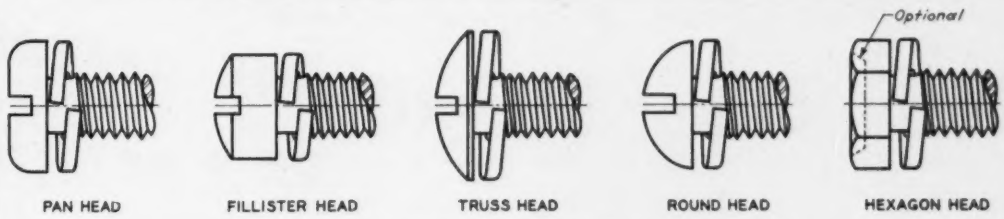


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MACHINERY'S DATA SHEETS 725 and 726

STANDARD SPRING LOCK-WASHER AND MACHINE SCREW ASSEMBLIES



Spring Lock Washer and Machine Screw Assemblies

Screw Size	Pan Head Screw			Fillister Head Screw			Truss Head Screw			Round Head Screw			Hexagon Head Screw		
	Washer Thickness	Washer Outside Diameter		Washer Thickness	Washer Outside Diameter		Washer Thickness	Washer Outside Diameter		Washer Thickness	Washer Outside Diameter		Washer Thickness	Washer Outside Diameter	
	Min.	Min.	Max.	Min.	Min.	Max.	Min.	Min.	Max.	Min.	Min.	Max.	Min.	Min.	Max.
# 4	0.031	0.195	0.208	0.020	0.171	0.184	0.034	0.225	0.238	0.031	0.195	0.208	0.020	0.171	0.184
# 5	0.031	0.207	0.220	0.020	0.183	0.196	0.031	0.299	0.312	0.034	0.237	0.250	0.020	0.183	0.196
# 6	0.034	0.248	0.261	0.031	0.218	0.231	0.031	0.310	0.323	0.034	0.248	0.261	0.031	0.218	0.231
# 8	0.031	0.305	0.319	0.031	0.243	0.257	0.047	0.367	0.381	0.031	0.305	0.319	0.031	0.243	0.257
#10	0.047	0.359	0.373	0.040	0.283	0.297	0.047	0.423	0.437	0.047	0.359	0.373	0.047	0.297	0.311
#12	0.062	0.414	0.429	0.047	0.320	0.335	0.070	0.468	0.483	0.047	0.382	0.397	0.047	0.320	0.335
1/4	0.062	0.480	0.496	0.063	0.384	0.400	0.078	0.542	0.558	0.062	0.448	0.464	0.062	0.448	0.464
5/16	0.078	0.602	0.618	0.062	0.508	0.524	.....	.....	.....	0.070	0.562	0.578	0.078	0.540	0.556
3/8	0.093	0.727	0.743	0.062	0.603	0.619	.....	.....	.....	0.093	0.695	0.711	0.094	0.635	0.651

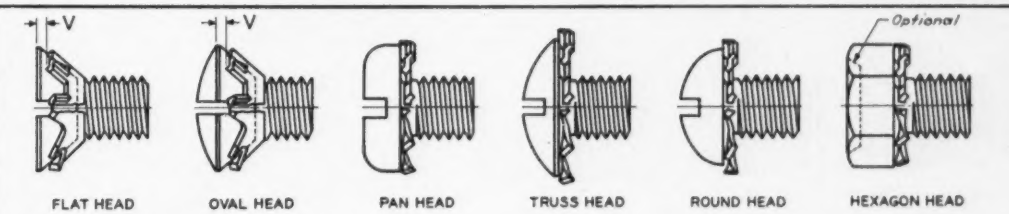
All dimensions are given in inches.

MACHINERY'S Data Sheet No. 725, March, 1953

Approved by American Standards Association as ASA B27.1

STANDARD TOOTH LOCK-WASHER AND MACHINE SCREW ASSEMBLIES

(For Types A and B, see Data Sheets Nos. 721 and 724)



Tooth Lock Washer and Machine Screw Assemblies

Screw Size	Flat and Oval Head Screws			Pan Head Screw				Truss Head Screw				Round Head Screw				Hexagon Head Screw			
	Washer Thickness		V Flush With Minus Tolerance of	Washer Thickness		Washer Outside Diameter		Washer Thickness		Washer Outside Diameter		Washer Thickness		Washer Outside Diameter		Washer Thickness		Washer Outside Diameter	
	Max.	Min.		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
# 4	.....	.....	.....	0.020	0.012	0.230	0.220	0.020	0.014	0.255	0.245	0.020	0.012	0.230	0.220	0.020	0.014	0.230	0.220
# 5	.....	.....	.....	0.020	0.014	0.255	0.245	0.020	0.014	0.285	0.270	0.020	0.014	0.255	0.245	0.020	0.016	0.255	0.245
# 6	0.020	0.016	0.026	0.020	0.014	0.285	0.270	0.022	0.016	0.320	0.305	0.020	0.014	0.285	0.270	0.020	0.016	0.285	0.270
# 8	0.020	0.016	0.030	0.023	0.018	0.320	0.305	0.022	0.016	0.381	0.365	0.023	0.018	0.320	0.305	0.023	0.018	0.320	0.305
#10	0.025	0.019	0.036	0.024	0.018	0.381	0.365	0.027	0.020	0.475	0.460	0.024	0.018	0.381	0.365	0.025	0.020	0.381	0.365
#12	0.025	0.019	0.041	0.027	0.020	0.410	0.395	0.028	0.023	0.510	0.494	0.027	0.020	0.410	0.395	0.027	0.020	0.410	0.395
1/4	0.025	0.019	0.047	0.028	0.023	0.510	0.494	0.028	0.023	0.590	0.567	0.028	0.023	0.475	0.460	0.028	0.023	0.475	0.460
5/16	0.028	0.023	0.060	0.034	0.028	0.610	0.588	.....	.....	.....	.....	0.034	0.028	0.610	0.588	0.034	0.028	0.590	0.567
3/8	0.034	0.028	0.072	0.040	0.032	0.760	0.740	.....	.....	.....	.....	0.040	0.032	0.695	0.680	0.040	0.032	0.660	0.640

All dimensions are given in inches.

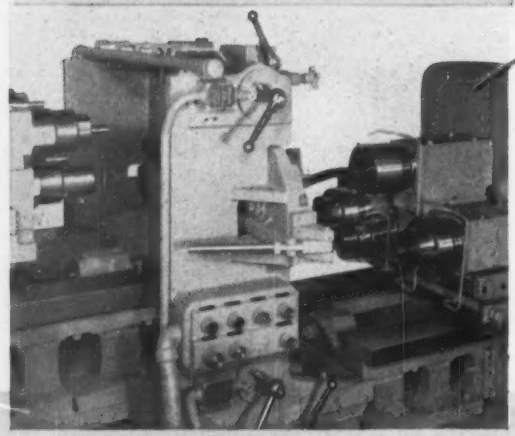
Type A tooth lock washer shown below the centerline.

Type B tooth lock washer shown above the centerline.

MACHINERY'S Data Sheet No. 726, March, 1953

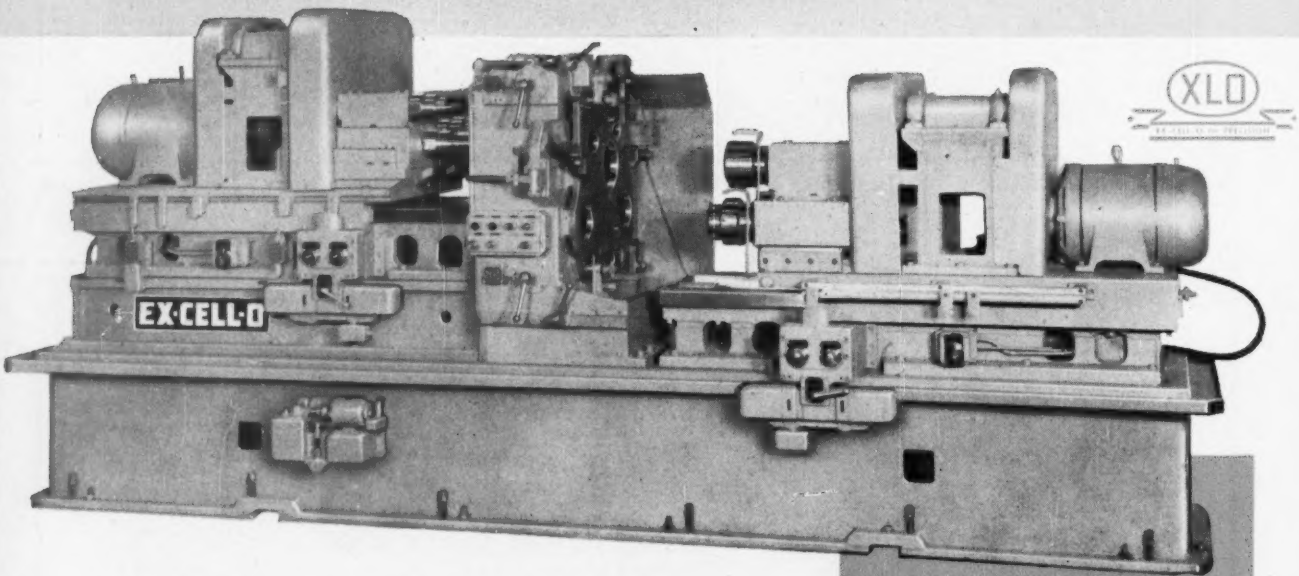
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Individual spindles are used for each bore to insure accuracy of location.



27 PRECISION OPERATIONS ON 9 HOLES IN ONE CYCLE

Another example of EX-CELL-O PRECISION ENGINEERING



SITUATION: The part is a magnesium center plate for a gear box. It's 27½" high and 30½" wide, has holes varying in size from 1⅛" to 6 15/16". Operations are semi-finishing, finish-boring and chamfering 8 holes, and finish-boring, plunge-facing a shoulder and chamfering the 9th hole, which is blind—a total of 27 precision operations.

SOLUTION: The use of this special precision boring machine makes it possible to complete all operations in one cycle, and to hold the required limits. The total tolerance on each of 9 bore diameters is .001", and the location of the bores are held within plus or minus .001".

For suggestions on your precision machining problems, call your Ex-Cell-O representative or contact Ex-Cell-O in Detroit.

Special Ex-Cell-O Precision Boring Machine

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MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT.

53-1

production, located at 737-743 Livingston St., Elizabeth, N. J. The plant comprises a general machine shop utilizing 21,000 square feet of floor space.

ANTHONY MALADRA was recently appointed assistant sales manager by KSM Products, Inc., Merchantville, N. J., manufacturers of studs and equipment for performing electric-arc stud welding operations.

Ohio

FRED L. PRITCHARD has been appointed representative in charge of the Cincinnati, Ohio, office of the Brown & Sharpe Mfg. Co., Providence, R. I. Mr. Pritchard was formerly at the Detroit, Mich., office. Also announced was the retirement of HOWARD K. JACKSON, who has been on special assignment in Cincinnati. Mr. Jackson was with the company for thirty-four years.

CHARLES H. JUDD has formed a stamping business to be known as JUDD INDUSTRIES, INC., located at 3148 W. 32nd St., Cleveland 9, Ohio. Associated with Mr. Judd are WAYNE C. KNERR and JOHN W. SNIDER. The new corporation will specialize in small progressive stampings, utilizing automatic feeds for high-production items.

DR. CYRIL G. VEINOTT has become associated with the Reliance Electric & Engineering Co., Cleveland, Ohio, as consulting engineer on alternating-current machinery. In this connection, he will be responsible primarily for the development and improvement of design methods and related engineering work. Dr. Veinott was with the Westinghouse Electric Corporation for the last twenty-five years.



Dr. Cyril G. Veinott, who is joining the Reliance Electric & Engineering Co. as consulting engineer.

RENIER CO., INC., is a newly incorporated firm of engineers and designers with offices at 5209 Euclid Ave., Cleveland, Ohio. The company will undertake the complete design of machine tools, hydraulic presses and equipment, and specialized machinery of all types. WILLIAM S. RENIER is president; and H. F. FISCHER, vice-president.

STAMCO, INC., New Bremen, Ohio, manufacturer of slitting and shearing equipment, announces the following promotions: ELTON W. BRUNS, who was chief draftsman for sixteen years, has become chief engineer; RICHARD E. BLACK has been appointed sales and service representative; and MYRON L. KUOK has been made chief draftsman, succeeding Mr. Bruns.

TOCCO DIVISION OF THE OHIO CRANKSHAFT CO., recently moved into a two-story plant at 4620 E. 71st St., Cleveland, Ohio. The 100,000 square feet of floor area in the building houses all Tocco engineering and production facilities. W. E. BENNINGHOFF and H. B. OSBORN, JR., are general manager and technical director, respectively, for the Division.

NATE A. WADE, general manager of the Detroit, Mich., branch of the Osco Steel Co., Cleveland, Ohio, has been promoted to the position of executive vice-president of the company. KENNETH M. FORD has been made assistant manager at the Detroit branch. Prior to this appointment, Mr. Ford was sales manager at the Cleveland branch.

DON F. SHOOK has become president of the Buckeye Brass & Mfg. Co., Cleveland, Ohio, succeeding OTTO G. GUNDEL. ALAN S. DALE has joined the company in the capacity of vice-president and general sales manager.

DR. PHILIP R. MARVIN has been elected vice-president of the Commonwealth Engineering Co. of Ohio, Dayton, Ohio. He will be in charge of customer relations and contract negotiations, as well as heading the industrial department.

FRANK W. JONES has joined the Bradford Machine Tool Co., Cincinnati, Ohio, assuming the position of general sales manager. Mr. Jones was formerly with the Cincinnati Bickford Tool Co.

JOHN F. NEFF has been named division manager in Toledo, Ohio, for the Aro Equipment Corporation, Bryan, Ohio. His headquarters will be at 1010 Madison Ave. in Toledo.

H. J. ZILSKE has been promoted to the position of chief engineer of the Hydraulic Power Division of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Mr. Zilske, active in hydraulics since 1936, has been with the Division for three years, handling various assignments in the sales and engineering departments.



H. J. Zilske, chief engineer of the Hydraulic Power Division, Hydraulic Press Mfg. Co.

Pennsylvania and Maryland

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., announces the following changes in personnel: P. C. SMITH has been appointed manager of the Transportation and Generator Division at East Pittsburgh, Pa., while W. R. SUGG, JR., has been made assistant manager, and G. A. MOORE, manager of manufacturing in the Division; and CARROLL B. DICK has become manager of the Westinghouse Electric Micarta Division, succeeding E. R. PERRY, who has resigned. Mr. Dick was formerly works manager of the appliance plant at East Springfield, Mass., although recently he had been appointed to the headquarters staff in Pittsburgh. Mr. Dick has been with Westinghouse since 1918.

UMBERT F. CORSINI has been appointed general superintendent of the Steel & Wire Works of the American Steel & Wire Division in Donora, Pa., by the United States Steel Corporation. Mr. Corsini, who was general superintendent of the South Works in Worcester, Mass., succeeds HAROLD COPE, who has been named Duluth, Minn., district manager of operations. WADE B. HOUK has been made general superintendent at the South Works in Mr. Corsini's stead. He was division superintendent of the wire mill.

E. F. MITCHELL, for sixteen years sales representative in the Michigan territory for the Simonds Abrasive Co., Philadelphia, Pa., was recently appointed Detroit district manager. His headquarters will be at the

branch office in Detroit, Mich. WILLIAM S. HEMSLEY has been appointed district manager in Chicago, Ill., replacing W. E. BYRNE, recently deceased. Mr. Hemsley was sales representative in the Indiana territory, with headquarters in Indianapolis. His post there will be filled by A. F. BODINE, who is joining the Simonds organization.

DR. C. B. POST, chief metallurgist of the Carpenter Steel Co., Reading, Pa., has been awarded the Bradley Stoughton Plaque, presented by the Lehigh Valley Section of the American Society for Metals, Bethlehem, Pa., to the Lehigh Valley metallurgist who has accomplished the most outstanding and useful metallurgical work during the year.

BENNETT BURGOON, JR., was recently made sales manager of the Metal-Working Division of Kennametal, Inc., Latrobe, Pa. Mr. Burgoon, who has been with the company for more than ten years, was formerly assistant to the general sales manager. NORMAN W. OBERG was appointed die sales engineer at Latrobe.

EDWARD H. PLATZ, JR., has returned to his post as manager of alloy sales for the Lebanon Steel Foundry, Lebanon, Pa. On leave of absence, he had been serving as nickel specialist in the Iron and Steel Division for the National Production Authority.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., announces the appointment of two men to the Pittsburgh staff: RALPH L. HARDING, JR., who will be market research analyst, and EDMUND C. TYNAN, who will be in the stainless tubing sales division.

H. THOMAS HALLOWELL, JR., president of the Standard Pressed Steel Co., Jenkintown, Pa., has been named to receive the 1952 Achievement Award of the National Metal Trades Association. The award is given "for outstanding achievement in the field of industrial relations." Mr. Hallowell will be so honored at the Middle Atlantic Assembly of NMTA, to be held in Philadelphia, Pa., May 6–7.

E. M. RICHARDSON, formerly manager of eastern division sales, has been promoted to the position of general sales manager of the Nice Ball Bearing Co., Philadelphia, Pa.

SAMUEL SLOAN AUCHINCLOSS executive vice-president, has been elected president of DeWalt Inc., Lancaster, Pa., subsidiary of the American Machine & Foundry Co. Mr. Auchincloss succeeds PAUL GARDNER, who recently resigned.

MARCUS W. KEYES has been appointed to the new position of sales manager in the Fiber Glass Division of the Pittsburgh Plate Glass Co., Pittsburgh, Pa.

JAMES R. MCCUTCHEON, JR., has joined the Homestead Valve Mfg. Co., Coraopolis, Pa., as sales manager of the Valve Division.

JOHN C. PANGBORN, JR., has been appointed Hagerstown district sales manager for the Pangborn Corporation, Hagerstown, Md. The district was recently formed and consists of counties in central Pennsylvania, most of West Virginia, part of Ohio and Kentucky, and western Maryland. Headquarters for the district will be at the Pangborn Hagerstown plant. At the time of his promotion, Mr. Pangborn served as expeditor and assistant head of the department of purchasing.



H. Thomas Hallowell, Jr., president of the Standard Pressed Steel Co., who will receive Metal Trades Award

Texas, Alabama, and Georgia

THOMAS F. SEARS CO., Bellaire, Tex., has been made representative in Texas and Louisiana for PIONEER PUMP, DIVISION OF DETROIT HARVESTER CO., Detroit, Mich.

ECLIPSE FUEL ENGINEERING CO., Rockford, Ill., has appointed the GENERAL COMBUSTION CO., Birmingham, Ala., district representative in Alabama and northwestern Florida.

KURT ORBAN CO., INC., New York City, has appointed the G D MACHINE TOOL CO., Tucker, Ga., distributor for the company's line of German-made machine tools. The distributor will cover the states of Georgia, Tennessee, North and South Carolina, Florida, and Virginia.

A. MILNE & CO., New York City, distributors of solid and hollow tool steels, announce the addition of a warehouse at 753 Chestnut St., N.W., Atlanta, Ga. The warehouse will be under the supervision of H. F. DICKS.

Wisconsin and Minnesota

KEARNEY AND TRECKER CORPORATION, Milwaukee, Wis., announces the appointment of the following sales personnel: J. ROBERT JONES, who was assistant branch office manager at Detroit, Mich., has been named sales manager for standard steel sales, succeeding HENRY H. LENTZER who was recently placed in charge of the new Special Machinery Division of the corporation; WILLIAM J. HUEBY, export sales representative and project engineer, has been made assistant sales manager, succeeding HAROLD W. KIPPERS, who has become sales manager of the Special Machinery Division. To fill the vacancies created by Mr. Jones's appointment and the selection of MORRIS L. HUTCHENS as chief engineer of the Division mentioned, the following men have been appointed: FRED G. CROSBY, JR., to become assistant branch manager at Detroit: JOHN F. BURG, to succeed Mr. Hutchens at White Plains, N. Y.; and ALFRED T. HOSTVEDT, to replace Mr. Burg at Syracuse, N. Y.

RALPH J. MILLER, JR., Cleveland, Ohio, representative of the Gisholt Co., Madison, Wis., has been transferred to the Chicago, Ill., office, where he is joining the Chicago representatives of the company. He is being replaced in Cleveland by CARL F. WELKE. Also announced by the company was the retirement of GEORGE E. THOMAS, who was a representative in Hartford, Conn.

LAWRENCE H. LEMKE, superintendent of the machine shop for D. J. Murray Mfg. Co., Wausau, Wis., has been promoted to the position of general superintendent.

NATIONAL MACHINE TOOL CO., Racine, Wis., manufacturer of machine tool products since 1918, has changed its corporate name to HEINRICH TOOLS INC.

HAROLD COPE, general superintendent of the Steel & Wire Works in Donora, Pa., of the American Steel & Wire Division, United States Steel Corporation, has been named manager of operations of the Division's Duluth, Minn., district. In assuming his new post in Duluth, Mr Cope takes over the position of JOHN A. SLENKER, whose promotion to assistant vice-president of operations was announced recently.

* * *

Jet engines built by a single United States manufacturer have flown more than 600 million miles.



Rome-Turney water-cooled condenser coil. Tube is ⅜" O.D., .042" ga., bent on a 1⅜" centerline diameter. Soldered helical fins are .135" wide, spaced 14 turns to the inch. Other types of heat exchanger coils are also shown. Rome-Turney forms coils out of tube up to 40 feet long, without joints.

For Copper Tube that can be BENT

Rome-Turney sees REVERE

Most of the Revere Metals are fabricated by usual methods into conventional products. Some of them, however, appear on the market in forms that are unusual and possess special advantages. Take these helical-finned copper coils produced by the Rome-Turney Radiator Co., Rome, N. Y. It takes extra skill to produce coils with such small radii. The company can produce the coils shown on a commercial basis, for use in air conditioning apparatus, air compressors, and general heating and cooling applications where compactness plus high heat transfer rates are essential.

How it is possible to make such tight turns is Rome-Turney's secret. Revere does not share in it, nor does Revere want to reveal a secret of its own, which is how we turn out copper tube in a special bending temper for an application such as this. All we can say is that the two methods dovetail very nicely. If you need copper tube that can be bent easily, and offers you as well the advantages of corrosion resistance, high heat transfer, easy joinings, see Revere. We also make copper pipe, tube in copper alloys, aluminum alloys, and electric welded steel tube. If required, the Technical Advisory Service will gladly collaborate with you, as it has with Rome-Turney, on selection and specification matters. Get in touch with the nearest Revere Sales Office.

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COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Obituaries

Jacob D. Cox

Jacob D. Cox, chairman of the board of the Cleveland Twist Drill Co., Cleveland, Ohio, died in Cleveland on February 16 at the age of seventy-one years. He was the son of Jacob Dolson Cox who founded the company with C. C. Newton in 1876. Mr. Cox was graduated from Williams College, and in his younger years ran a lumber business in the Pacific Southwest. He became associated with the Cleveland Twist Drill Co. in 1911, and became its president eight years later. In 1926, Mr. Cox wrote a thesis on the use of automatic tools which was published under the title "The Economic Basis of Fair Wages." He also formulated a profit-sharing plan for his company in 1915. The accruing benefits to employes resulted in long periods of service. Mr. Cox is survived by his wife and a sister.

Samuel Koffsky

Samuel Koffsky, chief engineer of the Simmons Machine Tool Corporation, Albany, N. Y., for sixteen years, died suddenly in Albany on January 15. Mr. Koffsky was graduated from Rensselaer Polytechnic Institute in 1923 and spent a period of eight years in helping to design a variety of bridges. In 1936 he joined the Simmons organization. Mr. Koffsky had a leading role in the company's machine tool designing and rebuilding work in World War II and in the current defense program. He also contributed to technical publications. He was a member of the American Society of Mechanical Engineers and the Society of Automotive Engineers.



Samuel Koffsky



Charles Arthur Booth

Charles Arthur Booth, executive vice-president of the Buffalo Forge Co., Buffalo, N. Y., died recently at the Buffalo General Hospital in Buffalo, N. Y., after a short illness, at the age of seventy-six years. Mr. Booth, a graduate of Worcester Polytechnic Institute, started with the company in 1900, became sales manager in 1907, and ten years later vice-president and director. He was a past president of the National Association of Fan Manufacturers and a member of the American Society of Mechanical Engineers and American Society of Heating and Ventilating Engineers.

EDWIN R. MOTCH, president of the Motch & Merryweather Machinery Co., Cleveland, Ohio, died on January 22 at the age of fifty-one years. Mr. Motch succeeded his father, who was one of the founders of the company, as president in 1946. He was an officer of the American Machine Tool Distributors' Association, having been elected first vice-president at the Association's annual meeting last September. Mr. Motch was also a director of Gould & Eberhardt, Inc., Avey Drilling Machine Co., Giddings & Lewis Machine Tool Co., American SIP Corporation, and Baker Brothers, Inc.

DANIEL GURNEY, vice-president and director of engineering at the Marlin-Rockwell Corporation, Jamestown, N. Y., died on February 3 at the age of fifty-two years. Mr. Gurney was a graduate of Oberlin College. His father, the late Frederick Gurney, was the founder of the Gurney Ball Bearing Co., forerunner of the Marlin-Rockwell Corporation, and he first became associated with the corporation from 1923 to 1929 in the engineering department. He left to go with the Bell Telephone Laboratories doing research work in sound motion pictures in New York City. From 1930 to 1938, Mr. Gurney held a position with the Landis Tool Co., Waynesboro, Pa., where he designed machinery for the manufacture of ball bearings. He then returned to the Marlin-Rockwell Corporation. Mr. Gurney was active in the Coordinating Research Council, a national group concerned with roller bearings and lubrications, and was a member of the Society of Automotive Engineers and the American Society of Tool Engineers.

CLARENCE SNYDER, chairman of the board of the Snyder Tool & Engineering Co. and its subsidiary, the Arthur Colton Co., Detroit, Mich., died at his winter home in Fort Lauderdale, Fla., on January 4, at the age of seventy-two years. Mr. Snyder started in business in 1902 with the National Cash Register Co. In 1910, he became associated with the Chalmers Motor Co., where he later became plant superintendent. During the first World War, he was superintendent of the C. C. Hinkley Motor Co. He organized the Snyder Tool & Engineering Co. in 1923 with the assistance of Fred Fisher, and specialized in designing high-production machines for the automobile and other industries. He is credited with having developed the trunnion type fixture, now commonly used in metalworking. Mr. Snyder is survived by his wife and two daughters.

FRANK H. GORDON, retired vice-president of the Lukens Steel Co., Coatesville, Pa., died on February 10 at his home in Coatesville at the age of seventy-four years. Mr. Gordon had retired in 1948, after an association of fifty-three years with the concern. He was one of the original incorporators of the company in 1917, and held the post of vice-president from 1928 until his retirement.

* * *

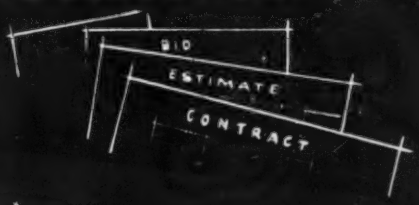
Color Movie on Precision Investment Casting

"Microcast—A Story of Industrial Progress" is the title of a new color movie prepared by the Microcast Division of Austenal Laboratories, showing step by step how precision investment Microcast parts are mass-produced for industry. The 16-millimeter film with a running time of twenty-two minutes gives a thorough explanation of this unique process developed for the economical production of virtually non-machinable high-temperature alloys.

This movie should be of special interest to all design and production engineers, engineering societies, and graduate groups of engineering students. It is available without charge, and information can be had by writing to Microcast Division, Austenal Laboratories, Inc., 244 E. 39th St., New York 16, N. Y.

CAN YOU COMPETE SUCCESSFULLY?

or . . . is out-of-date equipment putting you out of the running?



Obsolete equipment is a vicious tax on your costs and production . . . it ruins efficiency . . . make costs spiral sky-high . . . puts the KO on your estimates instead of the OK you are bidding for.

SIDNEY FLUID TRACER LATHES

HELP YOU OVERCOME COMPETITION

Furnished in connection with any size or model of Sidney Lathe, the FLUID TRACER makes it the most modern turning tool . . . SIMPLEST TO OPERATE. Small runs or quantity production show TREMENDOUS SAVINGS PER FINISHED PIECE. Change-over to standard lathe operation or back to tracer requires only a few SECONDS because no addition or removal of parts is necessary.

WRITE FOR BULLETINS



THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904

New Books and Publications

PRESSWORK AND PRESSES. By J. A. Grainger. 260 pages, 8 3/4 by 11 1/4 inches. 205 photographs; 147 diagrams. Published by the Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. Sold in the United States by THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y. Price, $8.30 (cloth board cover).

The author's aim in writing this book was to present to the man on the shop floor concerned with sheet-metal presswork, and to the man who designs tools with which to perform such work, an analysis of the problems encountered in medium and light presswork, and to offer practical methods for overcoming them, based on his long experience in press-shop practice. The book deals first with simple operations and then continues through the whole range of press operations, indicating the type of die for a given job, how it is used, and the type of machine on which it should be employed—with a discussion on the relative merits and shortcomings of the different types of machines. Next follows a consideration of the materials to be used, taking into account their defects and some of the difficulties met in working them.

Among the subjects covered are: blanking, bending and forming; combination tools; compound tools; progressive die work; shallow drawing; deep drawing; presses; press cushions; press setting; trimming and beading; standardization; and materials. In discussing the future trend, the author puts forward his ideas and suggestions with regard to the progress of the industry.

METAL DATA. By Samuel L. Hoyt. 526 pages, 7 by 10 inches. Published by the Reinhold Publishing Corporation, 330 W. 42nd St., New York 36, N. Y. Price, $10.

This is the second edition of a book formerly entitled "Metals and Alloys Data Book" which has been amplified by the addition of much new material. The intent of the author has then been to give a good cross-section of the most important data on metals and alloys, selecting the material from reliable sources and presenting it to metallurgists and engineers in a form usable for daily reference. Accordingly, the bulk of the material is in tabular form, nearly 700 tables and graphs being presented, while there is a minimum of descriptive text.

The chapter headings are as follows: Test Specimens; Hardness Tests; Wrought Steels; Heat-Treated Steels; Cast Steels; Cast Irons; Stainless Steels; Heat- and Corrosion-Resistant Casting Alloys; Super-Alloys; Non-Ferrous Alloys; Additional Metals; and General Data.

Coming Events

MARCH 17-20—Twenty-first annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS, to be held in Detroit at the Hotel Statler. Further information can be obtained by writing to Denham & Co., 925 Book Building, Detroit 26, Mich.

MARCH 23-27 — Eighth Western Metal Congress and Exposition sponsored by the AMERICAN SOCIETY FOR METALS, to be held in the Pan-Pacific Auditorium, Los Angeles, Calif. Secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

MARCH 25-27—National Production Meeting sponsored by the SOCIETY OF AUTOMOTIVE ENGINEERS, to be held at the Hotel Statler, Cleveland, Ohio. For further information, contact D. S. Kimball, Jr., general manager of Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio.

MARCH 31-APRIL 2 — First International Magnesium Exposition of the MAGNESIUM ASSOCIATION, at the Washington National Guard Armory, Washington, D. C. Further information can be obtained by addressing the Association at 122 E. 42nd St., New York 17, N. Y.

APRIL 20 — Aeronautic Production Forum of the SOCIETY OF AUTOMOTIVE ENGINEERS, to be held simultaneously at the Hotels Governor Clinton and McAlpin in New York City. Secretary, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

APRIL 20-22—METAL POWDER SHOW AND NINTH ANNUAL MEETING sponsored by the Metal Powder Association, to be held at the Hotel Cleveland, Cleveland, Ohio. For further information, write to the Association, 420 Lexington Ave., New York 17, N. Y.

APRIL 27-MAY 8 — BRITISH INDUSTRIES FAIR at Earls Court and Olympia, London, and Castle Bromwich, Birmingham, England. For further information, contact British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

APRIL 28-30—Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Deshler-Wallick Hotel, Columbus, Ohio. Secretary, Clarence E. Davies, 29 W. 39th St., New York 18, N. Y.

MAY 18-22—FIFTH NATIONAL MATERIALS HANDLING EXPOSITION sponsored by the Materials Handling Institute, to be held at Convention Hall, Philadelphia, Pa. For further information, write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

JUNE 1-3—Annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at the Homestead, Hot Springs, Va. Executive Secretary, John C. Sears, Empire Bldg., Pittsburgh 22, Pa.

JUNE 16-19—National Spring Technical Meeting and Welding and Allied Industry Exposition of the AMERICAN WELDING SOCIETY at the Shamrock Hotel, Houston, Tex. Executive secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

JUNE 28-JULY 2—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Statler, Los Angeles, Calif. Secretary, Clarence E. Davies, 29 W. 39th St., New York 18, N. Y.

* * *

Tool Engineering Day in New York

Six chapters of the American Society of Tool Engineers in the New York metropolitan area, southern Connecticut, and northern New Jersey will celebrate Tool Engineering Day on April 14. The celebration will include plant tours in a number of industrial plants in the area and a banquet at the Hotel New Yorker in the evening. The principal speakers will be Harold S. Vance, chairman of the board of the Studebaker Corporation, and Lieutenant General K. B. Wolfe, (Ret.), president of Oerlikon Tool & Arms Corporation of America, Asheville, N. C. The master of ceremonies will be Joseph E. Ridder, publisher of the *New York Journal of Commerce* and chairman of the board of American Bosch Corporation and the Arma Corporation.

* * *

Over Nine Million Dollars Paid for Suggestions

During the eleven years that the employment suggestion plan of the General Motors Corporation has been in operation, $9,232,540 has been paid for a total of 217,013 suggestions. The highest amount paid in one year was $1,678,372, this amount having been paid last year for somewhat more than 30,000 adopted suggestions.

CHANGE CUTTERS WITH A TWIST of the WRIST



TOOL UP WITH CONTINENTAL DRIVE

With Continental Standard Drive Holders you can change cutters with a *twist of the wrist* no matter how severe the operation has been. This will save you time and save your tools.

It is as simple as this: The Continental Standard Drive consists of integral double driving lugs on the shank of the cutter which engage double abutments in the socket of the holder. Double aligning bearings keep the cutter and holder in rigid alignment. The drive is machined from the solid—there are no pins or loose details. Result—a balanced, positive drive which is non-wedging and practically indestructible.

Available in standard counterbores, spot facers, countersinks—and on special tools such as multiple-diameter cutters, step counterbores, radius and chamfering applications. It is equally applicable for inverted operations.

Order through your Ex-Cell-O representative or direct from Continental Tool Works in Detroit.



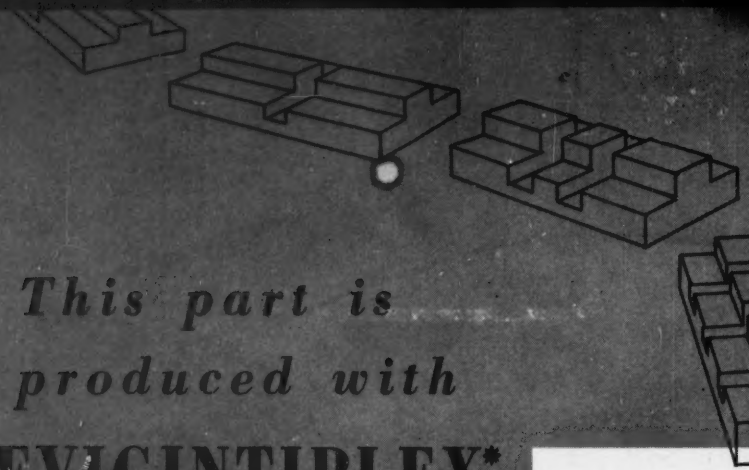
Continental Counterbores may be purchased individually or in sets. Write on your company letterhead for Catalog 60681.

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

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TOOL WORKS

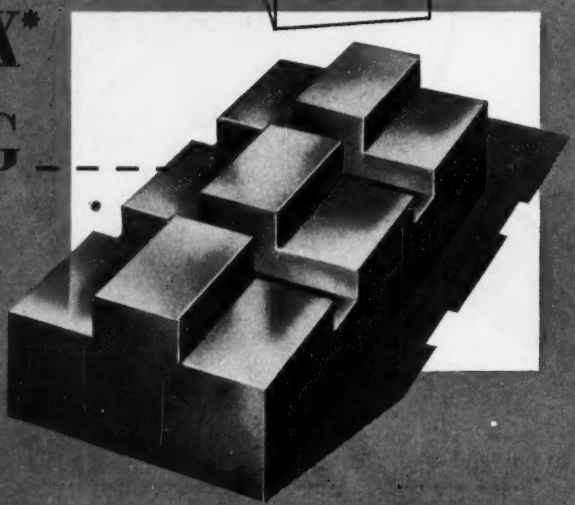
DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

52-25



This part is produced with

UNDEVIGINTIPLEX* BROACH TOOLING



* to have nineteen-fold use

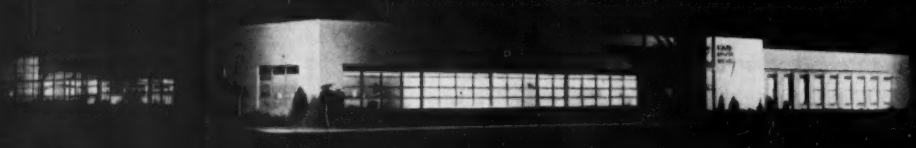
A metal parts manufacturer recently asked Detroit Broach for broach tooling which could produce 19 different sizes of a similar part. Because production of each size was low, it was essential that a universal tooling set-up be created to realize the full economies of broaching.

The problem involved the broaching of a tongue and one, two or three cross slots in the metal parts which varied in width and length.

Detroit Broach engineers tackled the problem and came up with undevigintiplex tooling. Two stations were provided on a 25-ton single ram vertical broaching machine to broach the tongue and the cross slots. To take up for the variation in the cross slots of the 19 different sized parts, spacers were used between the broaches. And for the differences in width and length of the parts, inserts were used in the workholding fixture. Result . . . 19 different sized parts produced in a single tooling set-up!

This is just typical of the economies that can be had through universal broach tooling when a number of similar low production parts are needed by manufacturers. You, too, may have an application that can be materially reduced in time or cost by the economy of broaching. It will pay you to consult Detroit Broach for engineering or production data.

WORLD'S LARGEST MANUFACTURER OF BROACHES AND BROACHING TOOLS EXCLUSIVELY



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PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on New Catalogues described in the March, 1953, issue of MACHINERY. Circle key number of item in which you are interested and print name and address on postcard.

NEW CATALOGUES

TRANSFORMER LAMINATIONS — Allegheny Ludlum Steel Corporation, Advertising Department, 2020 Oliver Bldg., Pittsburgh 22, Pa. Catalogue EM-3, presenting technical information and drawings of all the available standard shapes of transformer laminations manufactured by the company. This 123-page catalogue is available to companies in the field addressing their requests to the above address.

GAGE-BLOCKS—Webber Gage Co., 12900 Triskett Road, Cleveland 11, Ohio. Catalogue containing essential information on gage-blocks —how they are made; physical characteristics; how to use the accessories; care of blocks; and how to measure angles precisely. Can be obtained if requested on company letterhead direct to the above address.

MOTOR CONTROLS—Allen-Bradley Co., 1326 S. Second St., Milwaukee 4, Wis. Bulletin entitled "Quality Line of Motor Controls for All Industries," outlining the company's line of standard motor control apparatus. Bulletin available when requested on company letterhead direct to the above address.

BORING TOOLS—Flynn Mfg. Co., 133 Flowerdale Ave., Ferndale 20, Mich. Catalogue on the company's line of boring tools and accessories for tool-room and production operations. Can be obtained when requested on company letterhead.

THREAD COMPARATOR ACCESSORIES—Johnson Gage Co., Bloomfield, Conn. Folder showing Johnson thread comparator accessories for standard and special applications. Can be obtained by writing to the above address on a company letterhead.

PETROLEUM PRODUCTS AND CHEMICALS—E. F. Houghton & Co., Philadelphia, Pa. Booklet entitled "Houghton Products Meeting Government Specifications," listing rust preventives, lubricants, cutting oils, metal-working aids, and leather and synthetic rubber products which meet Federal requirements. Distribution of the booklet is limited to defense plants and Federal agencies. 1

CUTTING TOOLS—Morse Twist Drill & Machine Co., New Bedford, Mass. Catalogue 87, containing 303 pages of comprehensive facts on the company's entire line of cutting tools. Included are tabulated data on the application of cutting tools, complete information on the Unified Thread Tolerances adopted by the Metal Cutting Institute, and a new tap section. 2

EXTRUDED ALUMINUM SHAPES — Precision Extrusions, Bensenville, Ill. 98-page catalogue, covering over 4000 standard extruded aluminum shapes, rod, bar, and tubing, arranged for easy selection. The facilities of the company are described. A chart is included on the physical properties and recommended applications for the most generally used alloys. 3

INDUSTRIAL HEATERS—General Electric Co., Schenectady, N. Y. Bulletin GEA-5866, describing and illustrating the application of Calrod heaters by machinery manufacturers. Fourteen case histories are grouped by the following applications: heating surfaces, melting soft metals, radiant heat, heating liquids, and heating process air. 4

TUMBLING BARRELS — Tumb-L-Matic, Inc., New York City. Bulletin descriptive of multiple-unit tumbling barrels for high-production deburring, cutting, and finishing of wood, plastic, and metal parts. Recommendations on the right compounds to use for operations in both wet and dry tumbling are made. 5

CRANKSHAFT GRINDERS — Landis Tool Co., Waynesboro, Pa. Catalogue N-52, descriptive of the Landis Type DH crankpin grinders for the precision grinding of crankshafts on a production basis. Illustrations and sketches show design details, typical applications, and operating controls. 6

SCREW CONVEYORS—Link-Belt Co., Chicago, Ill. Book 2289, consisting of 92 pages of comprehensive information on screw conveyors and screw feeders, including selection tables and horsepower formulas, lay-outs and arrangements, and dimensional data to permit selection of screw conveyors for many types of applications. 7

PUMPS—Pioneer Pump & Mfg. Co., Detroit, Mich. Bulletin 160-26 on Pioneer centrifugal pumps for coolants and cutting oils, with photographs of typical installations on many types of machine tools; and on Rollway positive displacement pumps for handling lubricating oils and other liquids with lubricating properties. 8

CUTTING OILS—Sun Oil Co., Philadelphia, Pa. Bulletin 11, on Sunicut 11-S and 209-S, non-staining, dual-purpose oils developed primarily for medium- and heavy-duty operations on automatic screw machines. Bulletin 12, on Sunicut 102-S and 110-S, active type sulphur cutting oils, for heavy-duty operations. 9

OIL HYDRAULIC PUMPS AND CONTROLS—Vickers, Inc., Detroit, Mich. Catalogue 5001, containing 55 pages of technical data on the company's entire line of pumps, valves, cylinders, power units, transmissions, and control devices for the oil hydraulic operation of industrial machinery. 10

VELOCITY AND CORROSION — International Nickel Co., Inc., New York City. Reprint entitled "Effects of Velocity on Corrosion by Water," consisting of a general review on the factor of velocity in the corrosion of metals by water, particularly iron, zinc, copper, and their alloys. 11

TOOL STEELS—Bethlehem Steel Co., Bethlehem, Pa. Bulletin entitled "Quick Facts About Bethlehem Tool Steels," presenting concise information on the properties and selection of tool steels. A chart consisting of a properties guide and selector for Bethlehem tool steels is included. 12

TAPS—Threadwell Tap & Die Co., Greenfield, Mass. 56-page manual, an aid to users of cutting tools, containing helpful information on common tapping problems, in addition to tables of specifications, speeds, etc. Also included are definitions of tap and thread terminology and formulas for various threads. 13

SURFACE FORM GRINDER—Ex-Cell-O Corporation, Detroit, Mich. Bulletin 50226, describing the Style 84 precision surface form grinder used for grinding flat, grooved, or curved surfaces on the roots of jet-engine compressor blades and turbine buckets in an automatic cycle. 14

ROLLER HEARTH FURNACES—Surface Combustion Corporation, Toledo, Ohio. Bulletin SC-160, featuring three types—controlled-atmosphere, direct-fired, and convection heated —of roller hearth continuous furnaces, and describing typical process applications in both the ferrous and non-ferrous fields. 15

BALL BEARINGS—Nice Ball Bearing Co., Philadelphia 40, Pa. Catalogue 150, covering standard radial, thrust, and combined radial-thrust bearings of both precision and unground types. Catalogue is available to product designers and others who specify or purchase ball bearings. 16

WET-BLASTING EQUIPMENT — Cro-Plate Co., Inc., Hartford, Conn. Catalogue showing specific ways in which the costs of deburring, descaling, micro-inch surfacing, and general metal-finishing operations may be reduced by using Cro-Plate wet-blasting equipment. 17

CUTTERS—Ingersoll Milling Machine Co., Rockford, Ill. Catalogue 60B, containing 72 pages

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of data on inserted blade milling and boring cutters for all makes of equipment. Included is information on the carbide-milling of steel, proper selection of tools, cutting methods, and cutter grinds. 18

MACHINING TIME OF STEELS—La Salle Steel Co., Chicago, Ill. Bulletin 9, consisting of a reprint entitled "Relation of Machining Time to Material Cost," which considers comparatively various free machining steels. A formula to determine equivalent cost per part is presented. 19

OPTICAL GAGING — Eastman Kodak Co., Rochester, N. Y. Booklet presenting specifications and features of Models 2A and 3 contour projectors, and explaining how advanced methods of optical gaging cut inspection and tool-room costs. 20

PRESSES — Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 65-B, giving specifications of Niagara gap frame double crank presses of the "BI" and "B" series. Design features of the presses are explained. 21

PRESS TYPE BRAKES—Cyril Bath Co., Cleveland, Ohio. Bulletin explaining the features of the Bath press type brake which combines the functions of the press brake and the stamping press into one machine of greater versatility and speed. 22

EXPLAINING MAGNETIC FORCES—Eriez Mfg. Co., Erie, Pa. Chart designed by Arlo Israelson describing the natural forces causing magnetism and how these forces are organized by the application of an external magnetic field. 23

CASTINGS—American Car & Foundry Co., New York City. Manual entitled "Artistry in Metal," in which the story of gray iron casting as experienced by the company is presented. A foundry tour in pictures is included. 24

PILLOW BLOCKS — Dodge Mfg. Corporation, Mishawaka, Ind. Bulletin A-620, containing technical information on the new Dodge-Timken all-steel pillow blocks in sizes ranging from 2 15/16 inches through 10 inches. 25

PRESSES—Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 65-B, presenting the design features of Niagara gap frame double crank presses. Also described in detail is the new air-actuated electrically controlled sleeve clutch. 26

PRATT & WHITNEY PRODUCTS — Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn. Circular 557, containing concrete descriptions of the company's precision machine tools, cutting tools, and gages. 27

BORING MILLS AND RADIAL DRILLING MACHINES—Cincinnati Gilbert Machine Tool Co., Cincinnati, Ohio. Catalogue 1152, describing the company's line of table and floor type boring mills and radial drilling machines, their main features and condensed specifications. 28

HEAVY-DUTY LATHES—Simmons Machine Tool Corporation, Albany, N. Y. Bulletin 92952, describing the Simmons heavy-duty geared-head engine lathe which has been redesigned for more power and rigidity. Several of the new features are illustrated. 29

CIRCLE SHEARS — Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 70-F, descriptive of Niagara circle shears, ring and circle shears, and slitting shears, as well as combination circle shears and flangers. 30

BLAST CLEANING — Pangborn Corporation, Hagerstown, Md. Bulletin 223, on the Blast-master Rotoblast. Construction features of the batch blasting machine designed specifically for the newer abrasives are outlined. 31

HOLE PUNCHING UNITS—Wales-Strippit Corporation, North Tonawanda, N. Y. Catalogue BL, on the latest developments in Wales hole punching units. Eight pages of general information drawings provide helpful set-up explanations for users. 32

TOOL-ROOM LATHES — South Bend Lathe Works, South Bend, Ind. Bulletin 5302 on the company's new 16-inch twelve-speed lathe designed for ruggedness, ease of operation, and rapid production of precision work. 33

PERMANENT MAGNETS — Carboloy Department of General Electric Co., Detroit, Mich. Catalogue PM-110, listing prices of cast and sintered permanent magnets now being stocked in packaged quantities for the small user. 34

PLANT LAY-OUT — Wheeler Associates, Inc., Cleveland, Ohio. Booklet offering suggestions to industry on the arrangement of machines, equipment, and work areas in the best locations for efficient manufacturing. 35

LUBRICATION—Imperial Oil & Grease Co., Inc., Los Angeles, Calif. Booklet descriptive of Molub-Alloy, a grease manufactured from hydro-carbon base stock to which has been blended self-lubricating metallic solids. 36

HEAT-TREATING UNITS — Ipsen Industries, Inc., Rockford, Ill. Bulletin T-19, explaining the features of controlled-atmosphere heat-treating units for hardening, carburizing, carbonitriding, brazing, and martempering. 37

NEEDLE VALVES FOR HYDRAULIC LINES—Fluid Controls, Inc., Mentor, Ohio. Catalogue sheet containing engineering data on a new line of needle valves designed to provide precise control of fluid flow in a hydraulic line. 38

ELECTROPLATING — International Nickel Co., Inc., New York City. Reprint entitled "Electroplating Large Complex Shapes," in which design factors, welds, preparation, and plating methods are discussed. 39

AIR-OPERATED VALVES—Ross Operating Valve Co., Detroit, Mich. Bulletin 101A, explaining the characteristics and advantages of air power and describing three fundamental types of air control valves. 40

AUTOMATIC TRANSFER MACHINES—Motch & Merryweather Machinery Co., Cleveland, Ohio. Folder descriptive of four models of transfer machines which combine double-end machining and cutting off to accurate length. 41

UNIVERSAL SPEED REDUCERS—Universal Gear Corporation, Indianapolis, Ind. Catalogue 600, giving brief descriptions of speed reducers, and explaining the heliocentric principle of speed reduction. 42

FASTENERS — Simmons Fastener Corporation, Albany, N. Y. Catalogue 1252, covering the complete line of Simmons fasteners, and containing dimensional drawings, engineering data, and installation details. 43

MEEHANITE METAL—Meehanite Corporation, New Rochelle, N. Y. Bulletin 41, entitled "Meehanite Metal as a Material for Forming and Stamping Dies." Various die applications in all types of industry are shown. 44

FIXTURE CLAMPS — Morton Machine Works, Ferndale, Mich. Catalogue featuring the company's line of fixture clamps and component parts, and containing a set of templates for each item. 45

ALUMINUM HEAT-TREATING — General Electric Co., Schenectady, N. Y. Bulletin GEA-5912, describing the process of solution heat-treating, annealing, aging, and stabilizing of aluminum, and recommended heat-treating equipment. 46

DRILL PRESSES—Atlas Press Co., Kalamazoo, Mich. Catalogue 1800-A, descriptive of the Clausing 18-inch heavy-duty drill press and accessories. Specifications and a price list are included. 47

GRINDING WHEELS—Bay State Abrasive Products Co., Westboro, Mass. Folder illustrating Bay State abrasive wheels. A card is enclosed which may be sent to the company for information on specific abrasive products. 48

METAL PROCESSING — General Electric Co., Schenectady, N. Y. Booklet GEA-5797, on the annealing of malleable iron. Diagrams explain how to cut down over-all costs and how to shorten annealing cycles. 49

GEAR CHECKING—Michigan Tool Co., Detroit, Mich. Bulletin 6-702, describing the company's new line of bench type gear rolling fixtures that check size, eccentricity, and roll smoothness. 50

THREADING TOOLS—Rivett Lathe & Grinder, Inc., Boston, Mass. Bulletin 110D, describing the Rivett thread tool intended to replace the single-point thread tool, and illustrating its advantages. 51

AIR CONTROL VALVES—Valvair Corporation, Akron, Ohio. Bulletin PB, on the Valvair solenoid pilot air control valve designed for oil, water, vacuum, and inert gas lines. 52

TESTING MACHINES—Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Bulletin 4204, describing and illustrating Models 60-H and 12-H low-cost universal testing machines. .. 53

LUBRICANTS—E. F. Houghton & Co., Philadelphia, Pa. Leaflet descriptive of a new lubricant, Hi-Temp Oil 303, and other Hi-Temp oils manufactured by the company. 54

REBUILT MACHINE TOOLS—Miles Machinery Co., Saginaw, Mich. Catalogue 195, listing the company's available rebuilt machine tools, and giving pertinent information on them. 55

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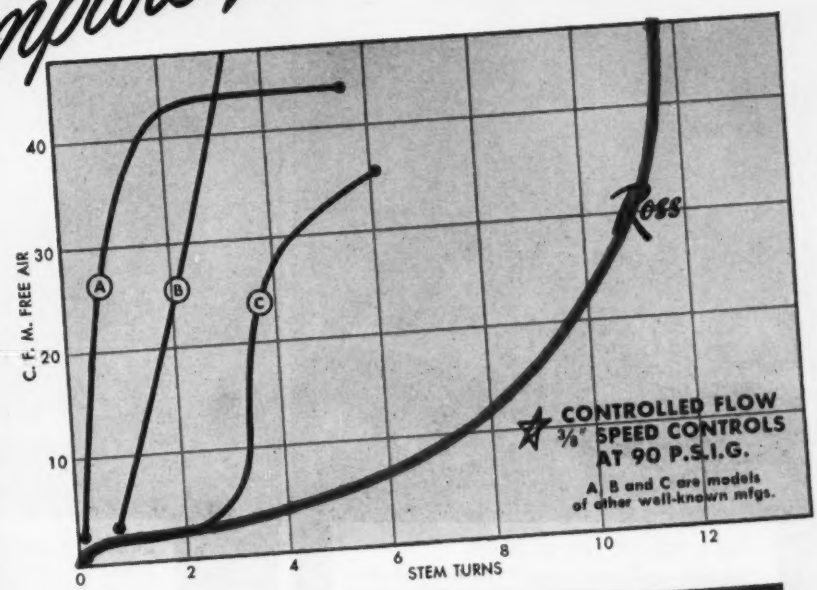
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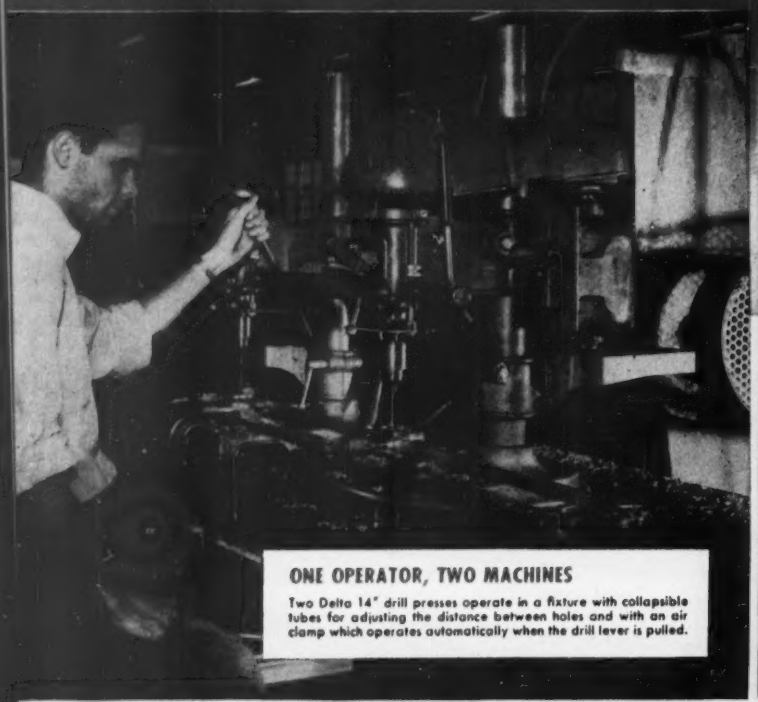
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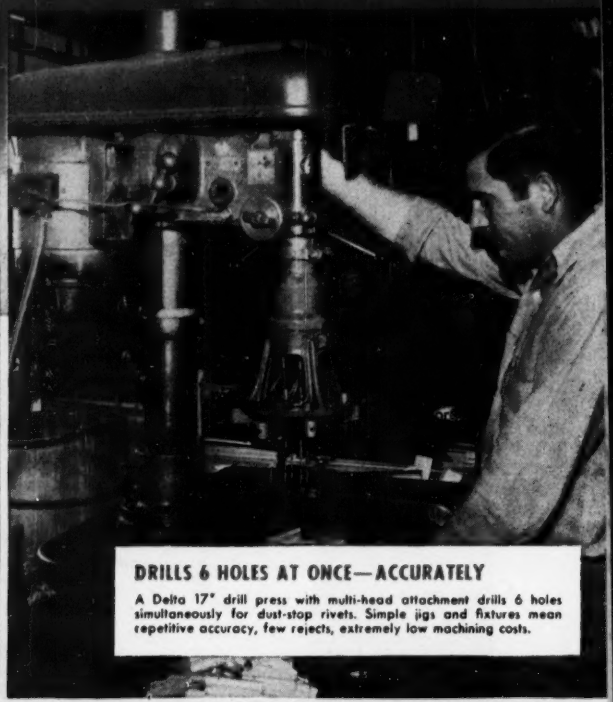
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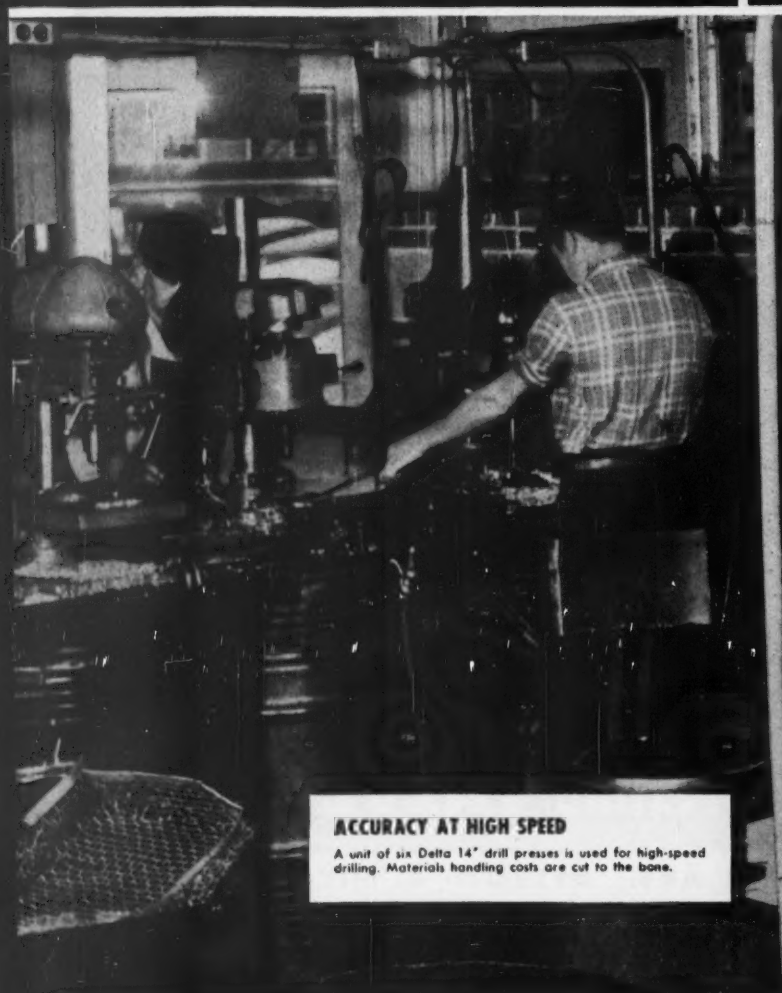
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Two Delta 14" drill presses operate in a fixture with collapsible tubes for adjusting the distance between holes and with an air clamp which operates automatically when the drill lever is pulled.



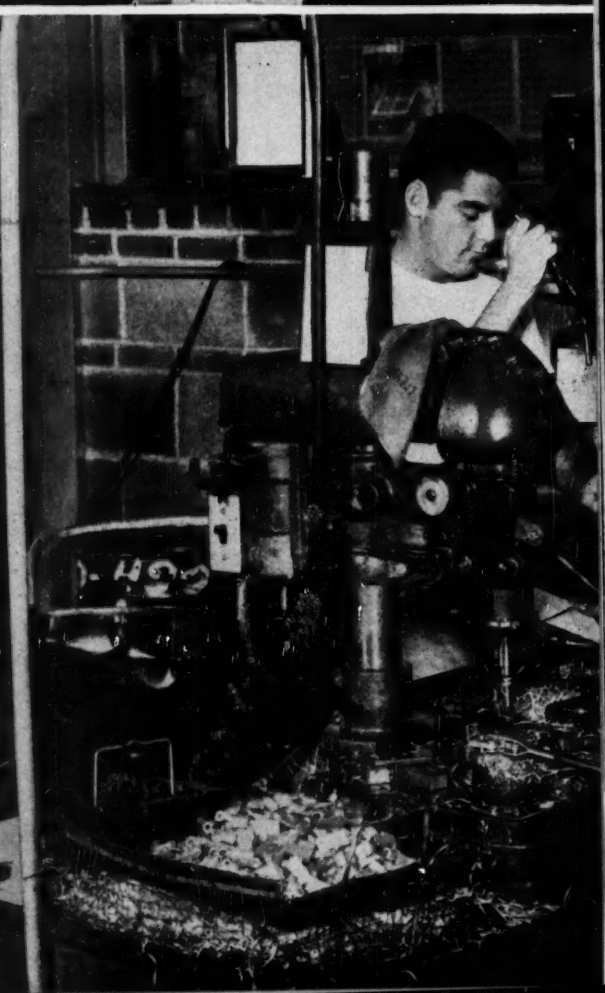
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A unit of six Delta 14" drill presses is used for high-speed drilling. Materials handling costs are cut to the bone.

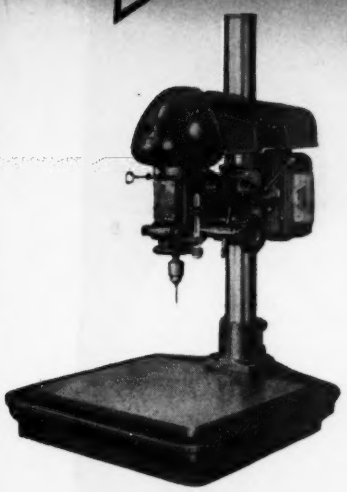


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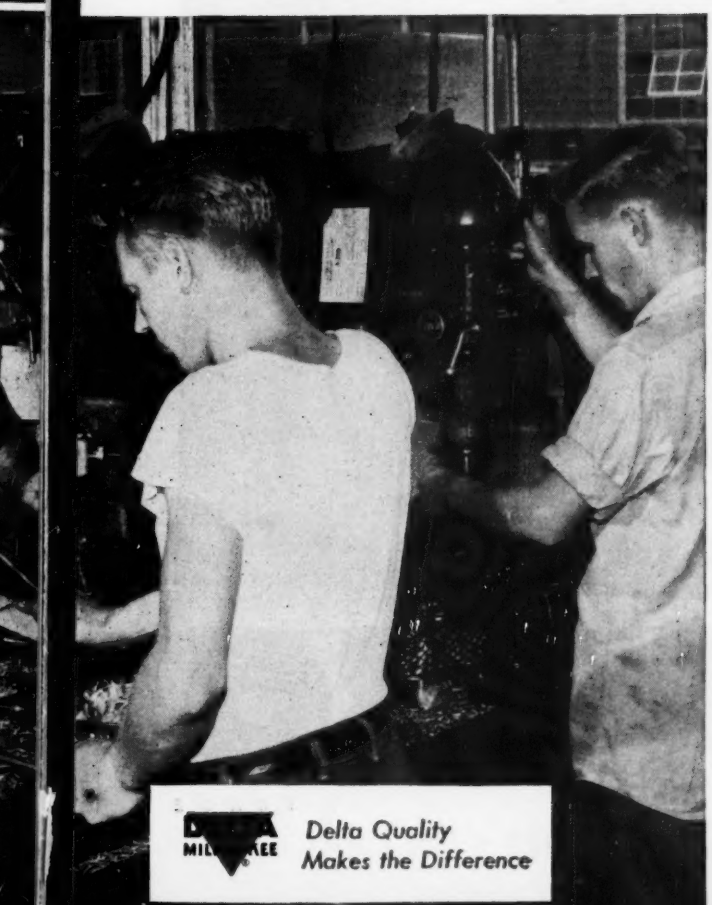
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For less than the cost of one major machine tool, Cupples Products Corp. bought 21 Delta drill presses, spotted them at key points in their production line and got the results listed above.

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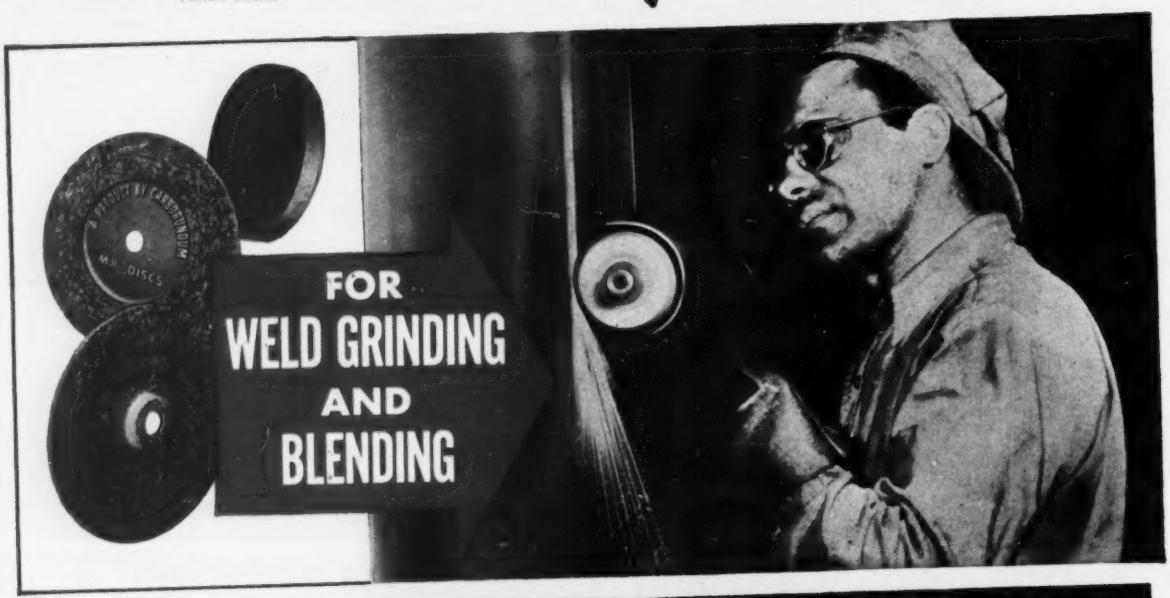
Your Delta dealer is listed in the yellow pages of your phone book under "Tools" or "Machinery." If you'd like catalog AB52, which describes the complete Delta line, ask him for a copy—or write to: Delta Power Tool Division, Rockwell Manufacturing Co., 614C North Lexington Ave., Pittsburgh 8, Pa.

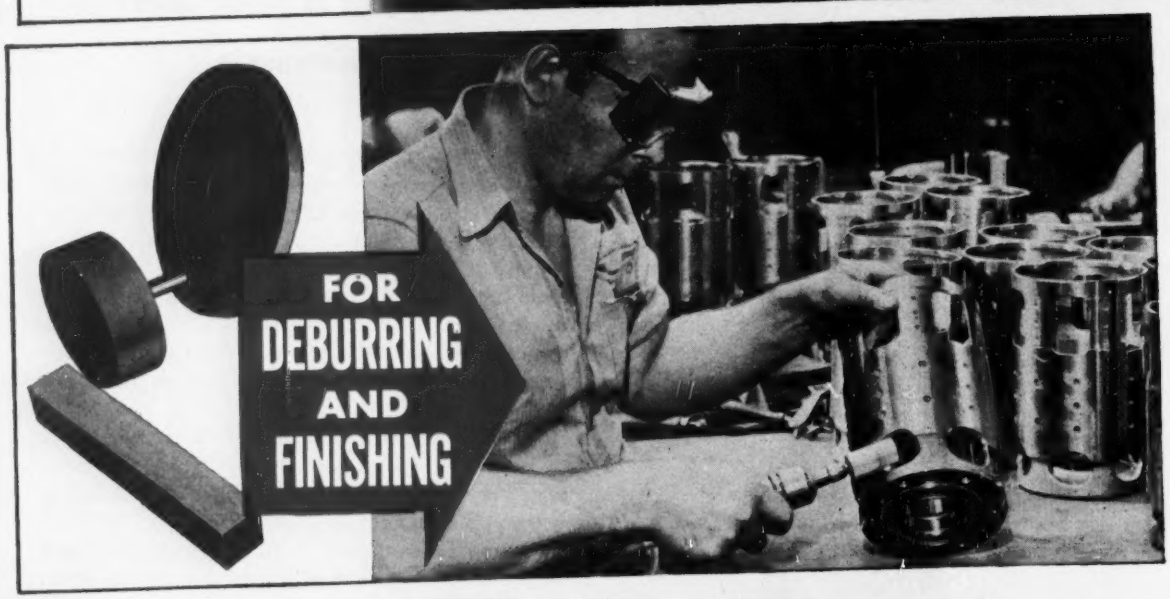
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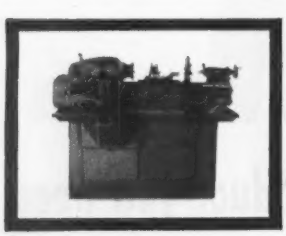
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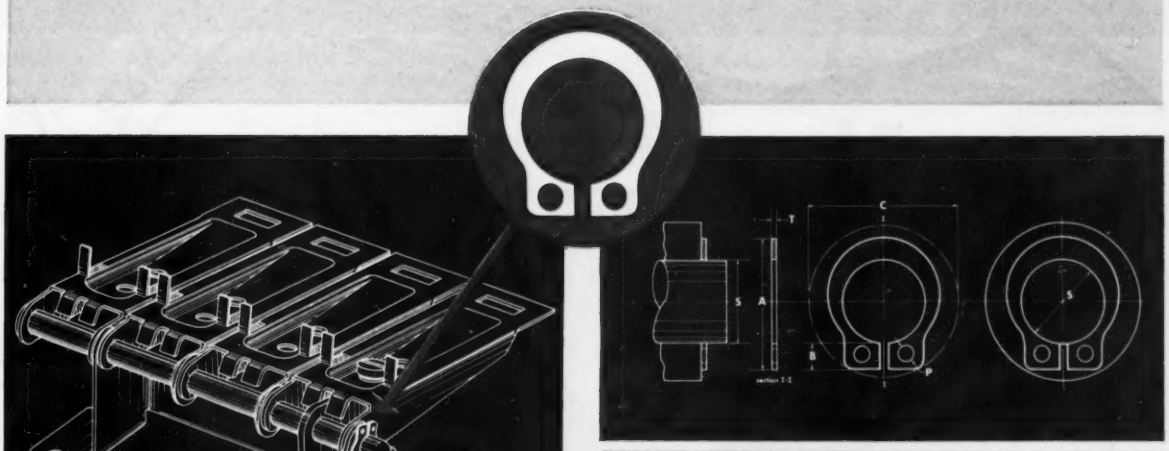




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SHAFT DIAMETER	Fract. Equiv. S	1/8"	—	3/16"	1/4"	5/16"	3/8"
	Dec. Equiv. S	.125	.136	.187	.250	.312	.375
	TOL.	±.002	±.002	±.002	±.002	±.003	±.003
RING DIMENSIONS	Thickness T	.025	.025	.035	.035	.042	.042
	TOL.	±.0015	±.0015	±.002	±.002	±.002	±.002
	Length A	.268	.285	.364	.437	.553	.626
	Lug B	.078	.078	.097	.097	.141	.141
	Hole P	.042	.042	.042	.042	.078	.078
	Min. Ring Clear C	.33	.34	.44	.50	.67	.73
Approx. Ultim. Thrust Load (Lbs)		20	20	25	35	50	60

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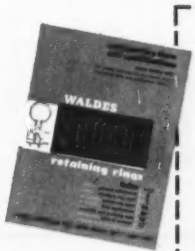
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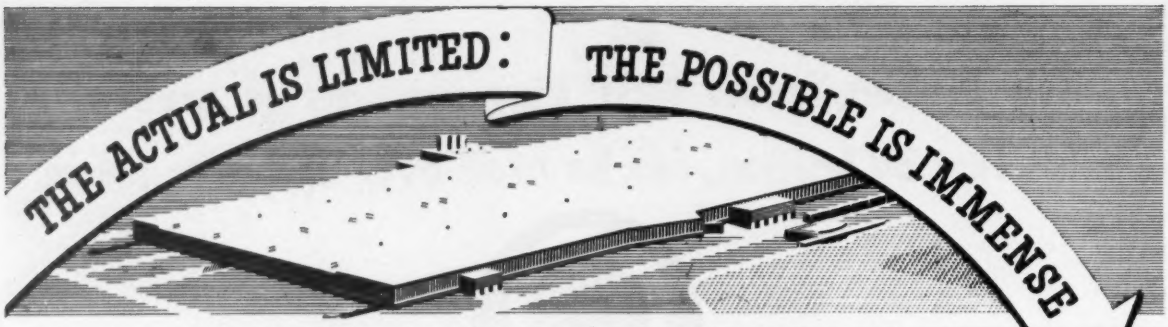
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WELDED STEEL DESIGN SIMPLIFIES PRODUCTION . . . CUTS COST ON MACHINE TOOLS

by **William B. Boice**
Boice-Crane Company, Toledo, Ohio

COSTLY machining operations like milling castings can be eliminated by designing for welded steel construction. On our jointer, for example, the top surface is now finish ground to close tolerance in one setup after welded assembly. Wherever machining is required, with steel construction precision tolerances are often held in one cut as compared to rough and finish cuts required on most castings.

Since steel is twice as rigid as gray iron, less material is needed to resist deflection under load. If made from castings, our jointer would weigh twice as much and still be subject to inaccuracies from deflection and warpage no longer experienced in the present welded steel construction.

With less material, less machining and fitting involved, shop costs are reduced. Furthermore, the modern appearance achieved with the welded design has greatly improved selling appeal.

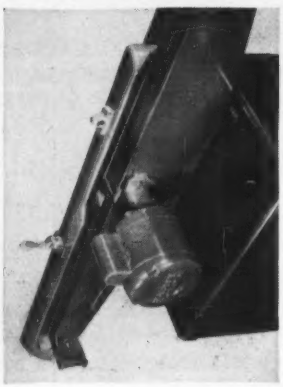


Fig. 3. Welded steel design *of 8" jointer is stronger, more rigid yet weighs half as much and costs less than cast construction. Courtesy, Boice-Crane Co.*

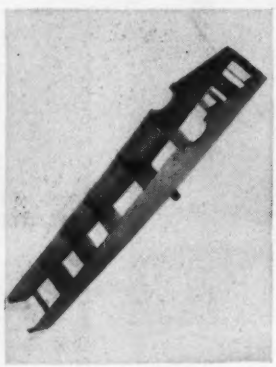


Fig. 4. Efficient girder-like structure *forms rugged frame for table. Top is welded to frame with intermittent welds and finish ground in one setting.*

WELDED DESIGN ALWAYS SAVES STEEL AND LOWERS COST

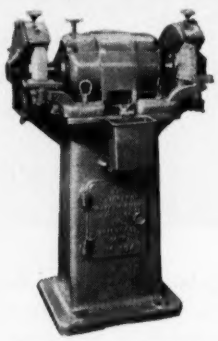


Fig. 1. Original construction *of pedestal grinder required costly milling and drilling using heavy machine tool equipment. Casting had to be filled and painted to obtain quality finish for sales appeal.*

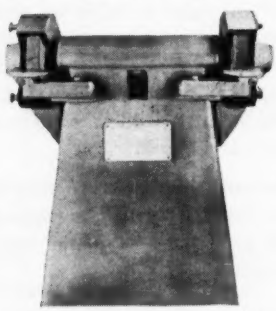


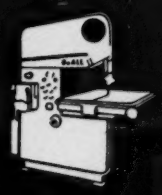
Fig. 2. Present welded steel design. *Quality of product and appearance improved to enhance sales appeal. Stability increased by lowering motor into pedestal base. Weight is cut 35% yet product is more rigid and costs 12% less to produce. Courtesy, The Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn.*

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SAW BANDS • GAGING EQUIPMENT • TOOL STEEL • CUTTING TOOLS • INDUSTRIAL SUPPLIES





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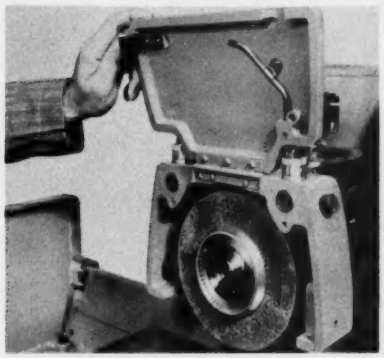
New Features Extend Range of Use of New DoALL Surface Grinders

Many Special Jobs Possible; Machines Grind Precisely to Handwheel Settings; Fully Automatic Grinding Available

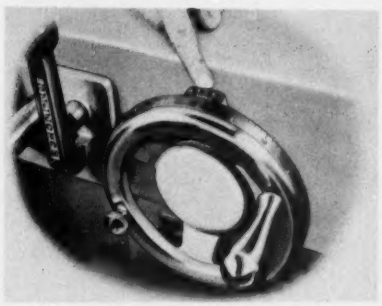
New DoALL Precision Surface Grinders for production and toolroom work are engineered to do an unusually wide variety of work to new standards of speed and accuracy. Construction of the new models is heavier, rigidity is greater.

Precision is such that the operator can grind exactly to handwheel settings. Exact duplication on production runs is possible without removing the work to check dimensions. Handwheels are equipped with calibrated slip rings for quick, easy zeroing.

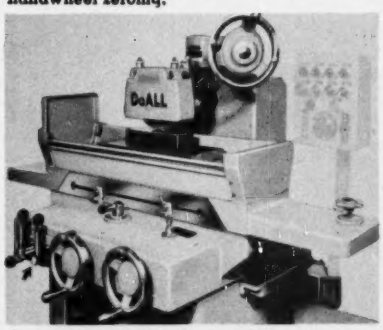
Work height capacity of the new models is 12½". Table speeds variable to 100 feet per minute are standard. Sizes range from 6" x 18" to 10" x 30".



"Cool-Grinding" tubing and controls are built into the wheel housing.



Calibrated slip rings provide quick, easy handwheel zeroing.



Accurately calibrated controls, centrally located for ease of operation.

Optional Attachments

For high speeds and heavy cuts without burning the work, DoALL's patented "Cool-Grinding" as well as flood cooling are available. In "Cool-Grinding" coolant flows *through* the wheel and out at point of cut. The two coolant systems are supplied from a common recirculating system, can be used independently or together.

For high production work, fully automatic grinding including automatic downfeed and crossfeed is available.

When plunge grinding several parts at one time, production can be increased by an automatic skip feed attachment to speed table travel between work pieces, minimizing non-productive time.

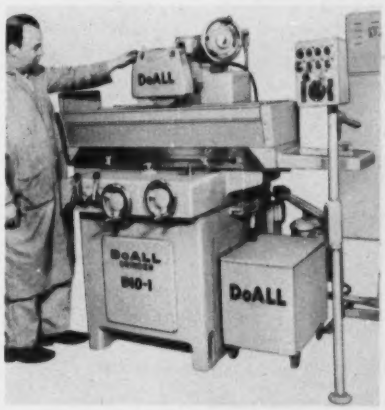
A high speed spindle attachment permits work with very small wheels in either vertical or horizontal position.

Heavy duty spindle and slow, powerful table feeds are available for crush grinding. An infinitely variable speed spindle drive provides great versatility. Another attachment permits straight, taper, angular and square grinding of cylindrical pieces.

Attachments for wheel dressing operations are available, including variable speed, uniform crossfeed and a slow, powerful crush dressing spindle drive. Alternate to this drive is a motor-driven crush roll stand. Other attachments and accessories are listed in a new Grinder Catalog.

Grinder Models

Model D6 is a popular size for tool and gage work and ideal for production of small, intricate parts. Wheel size is 7", chucks are 6" x 18" and 6" x 24",



Model D10 DoALL Grinder with coolant system and electric control panel.

a new size for this small grinder.

Model D8 is an intermediate size for production and toolroom use. Chuck size is 8" x 24". Spindle construction makes possible use of both 10" and 14" wheels having the same hole size. Among other advantages, the small hole in the 14" wheel provides additional wheel clearance and longer life.

DoALL D10 Grinders, with a new standard chuck size of 10" x 30", now offer work capacity and versatility not previously available in precision machines of this type. Either 10" or 14" wheels can be used.

Machine Filing Bulletins

An illustrated bulletin describing many advantages of DoALL Bench and Band Filers for faster, more accurate tool and die filing is available upon request.

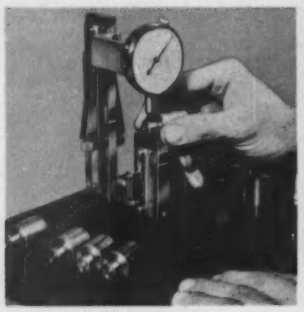
New Grinder Catalog

A new 20-page illustrated catalog explaining the advantages, design features and accessories available for new DoALL Grinders has just been issued. Specifications data is included. Copies are available upon request.

----See Next Page--->

GAGE BLOCKS TAKEN OUT OF "MOTHBALLS"

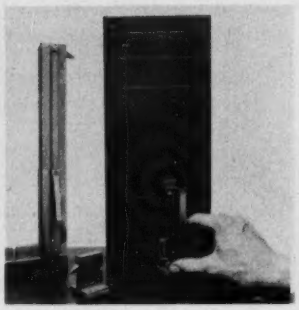
Now Put to Use for Toolroom and Production Gaging



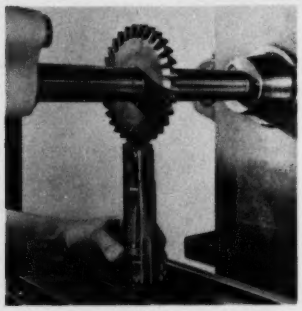
Indicating comparator for production checking of mass produced parts.



Large indicating snap gage incorporating pre-calibrated dial indicator.



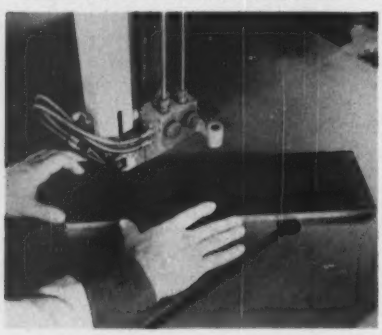
Straight line scribing done with new DoALL Micro-Step Gage Block setup.



Setting milling cutter. A carbide wear block is used to protect the gage.

Use of DoALL Tool Steel Insures Uniformity, Wearability of Tools, Dies, Parts at Low Cost

DoALL precision ground flat stock is a *controlled quality* oil hardening tool steel which provides easy machining, uniform hardening and maximum wearability of dies, tools and parts. The



range of 238 standard sizes, plus availability of special sizes, makes possible substantial savings in tool steel and machining time.

As illustrated, the procedure in using DoALL flat stock is to ink it, lay it out and contour saw it. Subsequent filing, grinding or other machining operations are dependent upon the part being made.

DoALL tool steel is carried in stock by DoALL Stores for prompt delivery. Detailed information is available in a bulletin, free on request.

Educational Programs

Upon request, the DoALL organization will present educational programs on band machining, surface grinding or precision gaging for technical societies, schools and plant groups.

Gage-Block Gages Quickly Assembled with New DoALL Micro-Step Gaging System

A new Micro-Step Gaging System, developed by DoALL, has taken gage blocks out of "mothballs", released them from captivity as the "jewels" of the inspection department, and put them to work in *direct* measurement of parts and machine settings in the toolroom and shop. For the first time, industry can fully utilize the millionths accuracy of these "measurement masters" to reduce errors, speed up gaging and eliminate the high cost of many special gages. Now gage blocks can be used practically and profitably as working tools. Gone is the day of keeping them under lock and key where their value and usefulness lay dormant most of the time. On the basis that idle tools make no money, DoALL has developed a method of creating dividends on gage block investments.

Essentially, the new System provides a means of quickly assembling an infinite variety of gages and layout scribers incorporating standard rectangular (USA type) gage blocks. These precision *gage-block gages* are then used for direct measurement. Typical instruments which can be assembled include indicating comparators, snap gages, go and no-go gages, internal gages, pin gages, depth gages, various scribers and many others.

Components

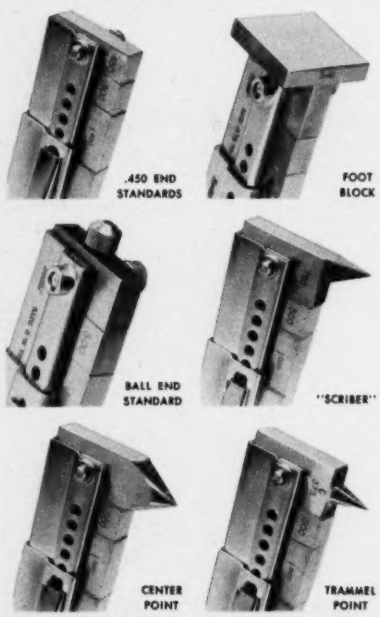
The components of the Micro-Step System are:

1. **Holders**—channel type for holding gage blocks in heights up to 72" or more; a unique caliper holder for setups to 6" is ideal for making outside and inside calipers, dividers, scribing compasses and others.

2. **Fully Exposed End Standards**—specially designed functional gage blocks provide the actual measuring surfaces of the assembled gage. The *unobstructed* surfaces extend beyond the ends of the holder, permitting innumerable setups never before possible with gage blocks in holders.

3. **Pre-calibrating Dial Indicators**—for making indicating *gage-block gages.*

4. **Gage Blocks**—DoALL, or any standard USA type.



Some of the Micro-Step End Standards available.

Wear Minimized

The design of the Micro-Step Gaging System prevents excessive wear of the gage blocks themselves. The blocks are not subjected to the sliding, wear-producing action of manual wringing, but are wrung together by moderate pressure of the holder clamps. Nor are they subjected to damaging contact with the part being measured.

Complete information regarding the DoALL Micro-Step Gaging System has been incorporated in a new Bulletin available upon request.

Saves 5 Man-Hours Per Day With DoALL Claw Tooth Saw Band

Runs Johnson Cut-off Saw at Top Speed; Blades Last 3 Times Longer

Schauer Mfg. Corp., Rossmoyne, Ohio, dramatically proved the importance of the "correct saw band, correctly applied" in cutting-off aluminum ingots on a Johnson Band Saw.

Operating the machine at its mid-speed No. 2 step pulley with a skip tooth saw band, Schauer was cutting 6"



square aluminum ingots in 11 minutes.

At the recommendation of a DoALL Sales-Service man, they changed over to a DoALL Claw Tooth Saw Band and use of DoALL "Tool-Saver" stick lubricant, with these results: machine was stepped up to full speed; cut-off time was reduced to 2½ minutes; 5 man-hours per day were saved, and saw band life was tripled.

The DoALL Claw Tooth Saw Band has hardened, positive rake angle teeth and a flexible back. The design causes the teeth to literally pull themselves into the work, hogging through many materials with amazing speed. A bulletin on this band is available upon request.

DoALL Men Offer Helpful Services

DoALL Sales-Service Men are factory trained to help customers on sawing, grinding, gaging and metal cutting problems. Selection of the right band tool, grinding wheel or gage for the job, machine adjustments, recommended feeds and speeds are but a few of the ways they can assist. They are backed by DoALL factory and laboratory facilities to help customers secure maximum operating efficiencies.

Western Metal Show

The Western Metal Exposition will be held in Los Angeles, March 23-27. DoALL will exhibit at Booth 152.

Band Machining Effects Savings in Steel Tank Production

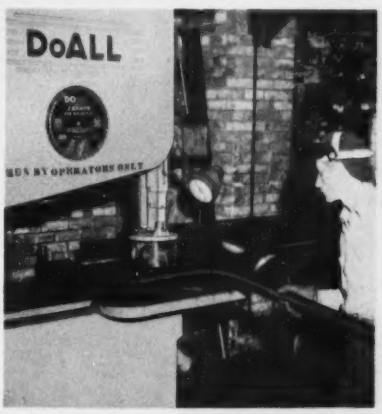
Contour and Cut-off Sawing 5 to 15 Times Faster With DoALL Contour-matic and Zephyr Machines

Table 1—Comparison DoALL Sawing with Previous Method

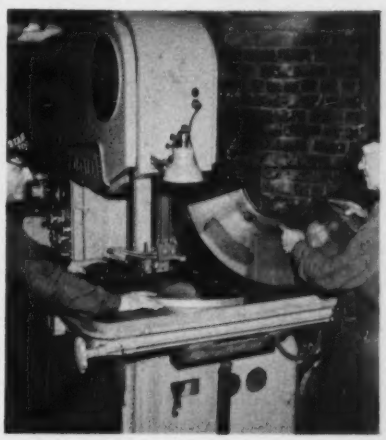
Job	Machine Used	Previous Sawing Time	Present Sawing Time
Cut-off 2¼ O.D. boiler tubes	Zephyr	3 minutes	7 seconds
Contour saw 16 gage black hot rolled iron	Zephyr	1 minute and 15 seconds	5 seconds
Production runs cutting off ½" O.D. boiler tubing	Zephyr	32 hours	6 hours
General heavy work	Contour-matic	varying times	1/6 as much time

For a wide variety of sawing jobs, Brown Steel Tank Company, Minneapolis, Minnesota, finds that its DoALL Zephyr Band Machine reduces sawing time up to as much as 15 times over the previous machine used. As a companion to the Zephyr, a DoALL Contour-matic machine is found to offer great versatility and ease of operation on extensive contour sawing work. The accompanying photos show work on gasoline truck tanks.

Table 1 shows typical benefits derived from use of these two machines.



Cutting 2¼ O.D. boiler tubing on DoALL Zephyr in 1/25 the time formerly required on a previous band saw.



Sawing a 1½" thick section of a forming die on the DoALL Contour-matic.

DoALL Laboratories Offer Customer Service

Recommended techniques for sawing or precision grinding of any material are offered by DoALL Laboratories after undertaking tests of samples. Reports give customers complete data on machines, band tools or wheels, speeds, feeds, setups, fixtures and other factors required to secure the most efficient results. Rate of production and finish attainable are stated. All tests are run on commercial machines to that results can be duplicated in the shop.

To secure this DoALL Laboratory Service call the local DoALL Sales-Service Store.

DoALL Zephyr machines are designed for safe, high speed sawing up to 15,000 blade feet per minute. They are widely used for friction sawing. Single or variable speed models are built with throat capacities from 16" to 60".

The DoALL Contour-matic is generally regarded as industry's most versatile and useful band machine. With a speed range of 40 to 10,000 band feet per minute, it can saw, slice, hone, file, polish or grind any material. It incorporates hydraulic operation to reduce operator fatigue and speed up work. As an all-purpose or single purpose tool it has proved to be a time and money-saver wherever used.

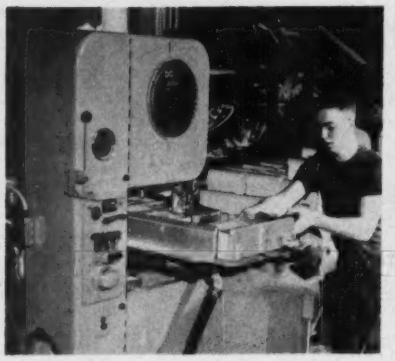
—See Next Page—→

Printer Saws "Zane Grey's Western" on DoALL Zephyr Band Machine

Production men in metalworking plants are familiar with the short cuts that DoALL Band Machines make possible. It might surprise them to learn how high speed bandsawing saves production time in magazine printing.

The photo shows a DoALL Zephyr cutting stacks of Zane Grey's Western at Western Printing and Lithographing Co., Racine, Wisconsin. The magazines are printed and bound double for production efficiency. Here's what William L. Reisdorf, Bindery Foreman, says about use of the DoALL Zephyr for parting his "Siamese twins":

"We band saw 13 stacks of 12 books each per minute, or 18,720 books per hour, using a specially designed pusher type feeding device. The clay paper is very abrasive and heat generated causes the binding glue to melt at point of cut. These factors would greatly reduce saw band life. By installing a special blade oiling device, blade life is doubled, teeth don't load and objectionable dust is eliminated. We have a very efficient operation with a very satisfactory time saving over the method previously used."



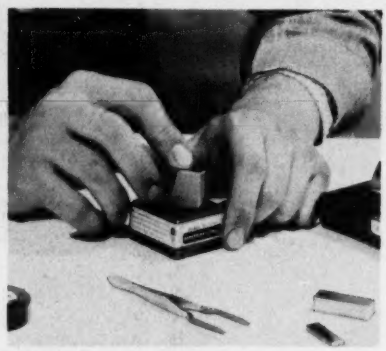
Sawing double magazines in half with a DoALL Zephyr.

All DoALL Products May be Seen in "Action"

Demonstrations of DoALL equipment at any plant can be arranged simply by calling the nearest DoALL Sales-Service Store listed below.

New Deburring Stone Keeps Gage Blocks in Shape

In normal use, small burrs may be raised on the edge of gage blocks, interfering with their wringability and accuracy. The use of a DoALL Deburring Stone will restore the surface of a burred block to its original perfect condition. The block is simply rubbed firmly against the surface of the stone. When properly used, the dimensional accuracy of the block will not be disturbed, but the tiny burrs will be removed entirely. Details are available upon request.



DoALL deburring stone in use.



CALL DoALL locally at these Sales-Service Stores

ATLANTA 3, GA.
304 Decatur St., S.E.
Call DoALL: Walnut 5384

BALTIMORE 12, MD.
5621 York Rd.
Call DoALL: Hopkins 5340

BIRMINGHAM 4, ALA.
800 N. 24th St.
Call DoALL: Birmingham 3-0502

BROOKLINE 46, MASS.
89 Washington St.
Call DoALL: Longwood 6-9555

BUFFALO 23, N. Y.
1063 Kenmore Ave.
Call DoALL: Riverside 3424

CEDAR RAPIDS, IOWA
624 Fifth St., S.E.
Call DoALL: Cedar Rapids 3-0616

CHARLOTTE 2, N. C.
401 S. Mint St.
Call DoALL: Charlotte 4-2579

CHICAGO 39, ILL.
4650 W. Fullerton Ave.
Call DoALL: Albany 2-5300

CINCINNATI 2, OHIO
536 Sycamore St.
Call DoALL: Main 3929

CLEVELAND 3, OHIO
6517 Euclid Ave.
Call DoALL: Henderson 2-1515

DALLAS 2, TEXAS
1628 Industrial Blvd.
Call DoALL: Riverside 4536-37

DAYTON 4, OHIO
365 Vermont
Call DoALL: Michigan 2121

DENVER 4, COLO.
1187 Stout St.
Call DoALL: Alpine 7444

DETROIT 27, MICH.
15010 Plymouth Rd.
Call DoALL: Broadway 3-4141

GRAND RAPIDS 7, MICH.
410 Hall St., S.E.
Call DoALL: 5-2191

HARTFORD 5, CONN.
45 Farmington Ave.
Call DoALL: Hartford 5-6664

HOUSTON 2, TEXAS
121 St. Emanuel
Call DoALL: Capital 6588

INDIANAPOLIS 2, IND.
1401-3 N. Illinois St.
Call DoALL: Plaza 6496

JACKSONVILLE 7, FLA.
1106 Kings Ave.
Call DoALL: Jacksonville 9-7087

KANSAS CITY 6, MO.
1019 E. Truman Rd.
Call DoALL: Harrison 5857

LOS ANGELES 21, CALIF.
1316-18 S. Santa Fe
Call DoALL: Trinity 3871

MILWAUKEE 5, WIS.
2427 W. North Ave.
Call DoALL: Division 2-2950

MINNEAPOLIS 4, MINN.
1328 S. Fourth St.
Call DoALL: Atlantic 4341
St. Paul—dial red "O" for Zenith 2399

NASHVILLE, TENN.
1923 Church St.
Call DoALL: 42-0605

NEW YORK 10, N. Y.
67 Lexington Ave.
Call DoALL: Murray Hill 4-1514

NUTLEY 10, N. J.
88 Park Ave.
Call DoALL: Nutley 2-6767

PHILADELPHIA 24, PENNA.
2053-59 E. Glenwood Ave.
Call DoALL: Cumberland 87400

PITTSBURGH 21, PENNA.
600 Rebecca Ave.
Call DoALL: Fremont 1-5200

ROCKFORD, ILL.
123 Seventh St.
Call DoALL: Rockford 47848

SAN DIEGO, CALIF.
(Customer Service)
Call DoALL: Main 8-2840

SAN FRANCISCO 3, CALIF.
952 Howard St.
Call DoALL: Garfield 1-4784

SEATTLE 22, WASH.
520 E. Pike St.
Call DoALL: East 7500

ST. LOUIS 6, MO.
1945 N. Broadway
Call DoALL: Central 3620

SYRACUSE 4, N. Y.
106 Cortland Ave.
Call DoALL: Syracuse 76-3193

TOLEDO 6, OHIO
2952 Monroe St.
Call DoALL: Garfield 8309

TULSA, OKLA.
207 W. Archer St.
Call DoALL: 35443

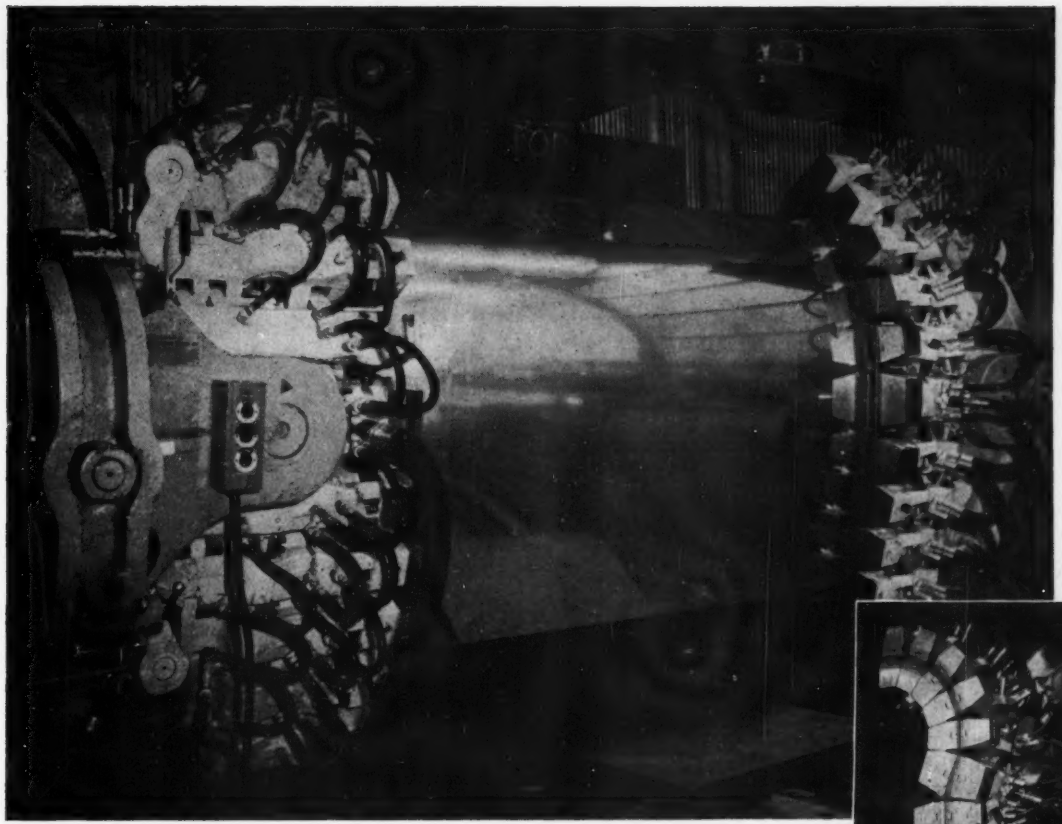
MONTREAL, QUEBEC, CANADA
583 Inspector St.
Call DoALL: University 6-1264

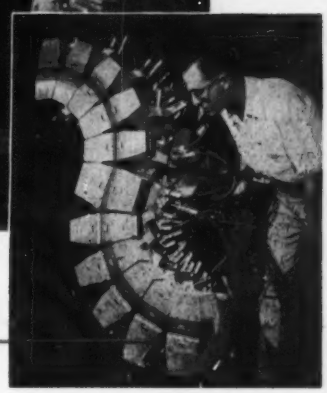
TORONTO 10, ONTARIO, CANADA
37 Clarkson Ave.
Call DoALL: Redfern 4238

MEXICO CITY, D. F., MEXICO
Calle de las Artes #48
Call DoALL: Mexicana 36-27-95
or Ericcson 18-63-74

Vol. 2—No. 1—62M—2-53

PRINTED IN U.S.A.





This curve is starting a revolution!

Hufford HYDRA-CURVE JAWS widen stretch-wrap forming applications.

Here's a revolution in the making—a new tool that not only cuts costs on many vital sheet stretch-wrap forming operations but does jobs that can't be done by conventional means!

What's different about Hydra-Curve Jaws?—They load like any straight jaw, but before work is stretch-wrap formed, *they curve the sheet to match the cross sectional die curve.*

What you gain—This pre-curving not only permits deeper curves to be shaped, but does so with considerable savings in stock! Sheets no longer must make the exaggerated transitions from a straight jaw to deep convexities or concavities of a die. Fewer wrinkles develop; require less stretching to remove. Scrap losses are negligible.

Big material savings—Outstanding advantage is savings in sheet stock—as high as 30% in extreme cases, depending on die. *Material savings alone amount to several hundreds of dollars daily* in one user's plant.

Lower labor costs—Parts heretofore difficult or impossible to stretch-wrap form are now made with comparative ease. Excellent skin fits on these parts cut assembly hours, adding to plane output.

Saves furnace hours—Many parts can now be satisfactorily stretch-wrap formed from material in the "ST" condition.

Hufford

HYDRA-CURVE JAWS CAN HELP YOU!

This new Hufford development is revolutionizing stretch-wrap forming... it may well be the answer to your forming problem. Write for facts today!

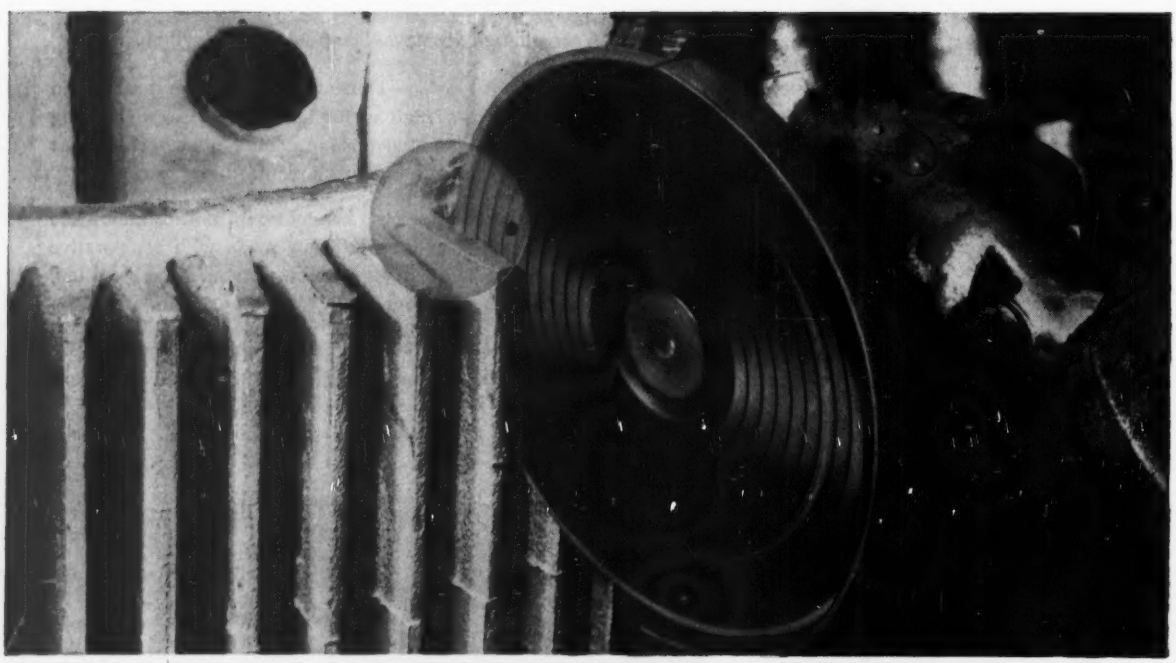
HUFFORD
Machine Works Inc.
EL SEGUNDO CALIFORNIA

Manufacturers of



BLENDING IN A WELDED CORNER is a job you can do faster and better with a Norton BFR semi-flexible wheel.

Here's your "TOUCH OF GOLD" team for more economical portable grinding



CLEANING OUT FINS of a compressor casting is a hard job made easy — when you use a Norton BD rigid wheel.

There's gold in hub-wheel grinding — the real cost-cutting, value-adding "Touch of Gold" that you can bring to job after job with these faster, safer Norton Reinforced Hub Wheels!

They're the long popular Norton BD rigid wheel and the newer Norton BFR semi-flexible wheel. Beyond any doubt they're the most useful pair ever built for portable grinding. They're lighter and easier to handle than cup wheels, longer lasting than coated abrasive discs, and more versatile than either.

Built-in speed and safety

Made of aluminum oxide and silicon carbide abrasives, resinoid bonded, both the BFR and BD wheels cut fast and cool, without spalling or loading. And for tops in safety, they're reinforced with nylon webbing. Even if breakage occurs this strong web keeps pieces from flying off in all directions, until the machine can be stopped.

Covering a wide job range

Where finish is most important — especially for blending corners and contours — you'll like the way the semi-flexible BFR wheel hugs the work. Where stock removal is the main factor, you'll prefer the heavier duty, rigid BD wheel. And with both these wheels working for you, you have a grinding team that will help you turn out better products faster and easier — adding the profit-boosting "Touch of Gold" to countless every-day jobs.



NEW! . . . The Norton BF Wheel For Light Finishing

Meet the latest Norton development for your lighter finishing jobs. Basically, the new BF wheel is built like the BFR wheel but is designed especially for periphery grinding. You'll find its flexibility in the softer grades (G and I) ideal for blending and smoothing curved surfaces and corners. The hardest grade (K) is more rigid — best for light welds and sharp edge applications. In all grades it tends to finish as it cuts.

Like the BFR and BD wheels, the new BF wheel cuts fast and free and has a high safety factor. Like them, too, it features versatility, covering a range of usefulness that includes finishing stainless steel welds, deburring metal parts such as stampings and removing gates and fins from molded plastics. Let the new BF wheel add "The Touch of Gold" to many of your own light-duty grinding jobs.

GET YOUR NORTON DISTRIBUTOR TO DEMONSTRATE these versatile Norton wheels in your shop. He'll be glad to help you on any grinding problem and, if necessary, he'll call in a Norton Abrasive Engineer. Or write to NORTON COMPANY, Worcester 6, Mass. for descriptive folder #225. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

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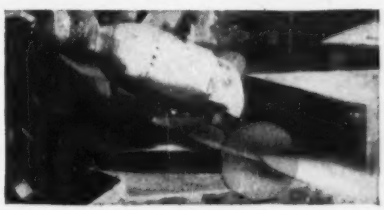
NORTON
ABRASIVES

Making better products to make other products better

Put the value-adding "TOUCH OF GOLD" into jobs like these



Cutting down a heavy weld — rigid BD



Blending a welded radius — semi-flexible BFR



Smoothing a flame-cut edge — rigid BD



Grinding welds in a fabricated cone — semi-flexible BFR



Smoothing a weld seam — semi-flexible BFR



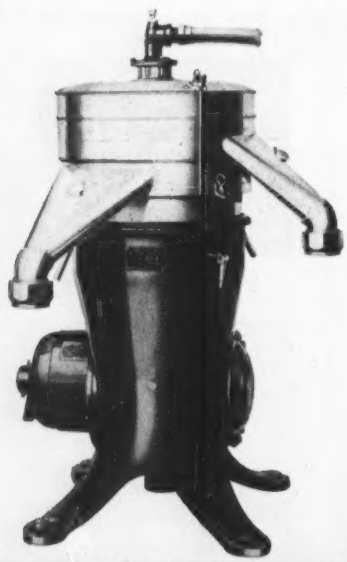
Notching risers on gray iron castings — either type

NO GETTING AROUND IT!



Tests Are More Accurate When the Oil is Centrifuged





Test oils, like many other kinds of factory oils, can be profitably purified by centrifugal force. For example, when a machine tool or its component parts is tested, the test oil is likely to pick up core sand or other solids which must be promptly removed.

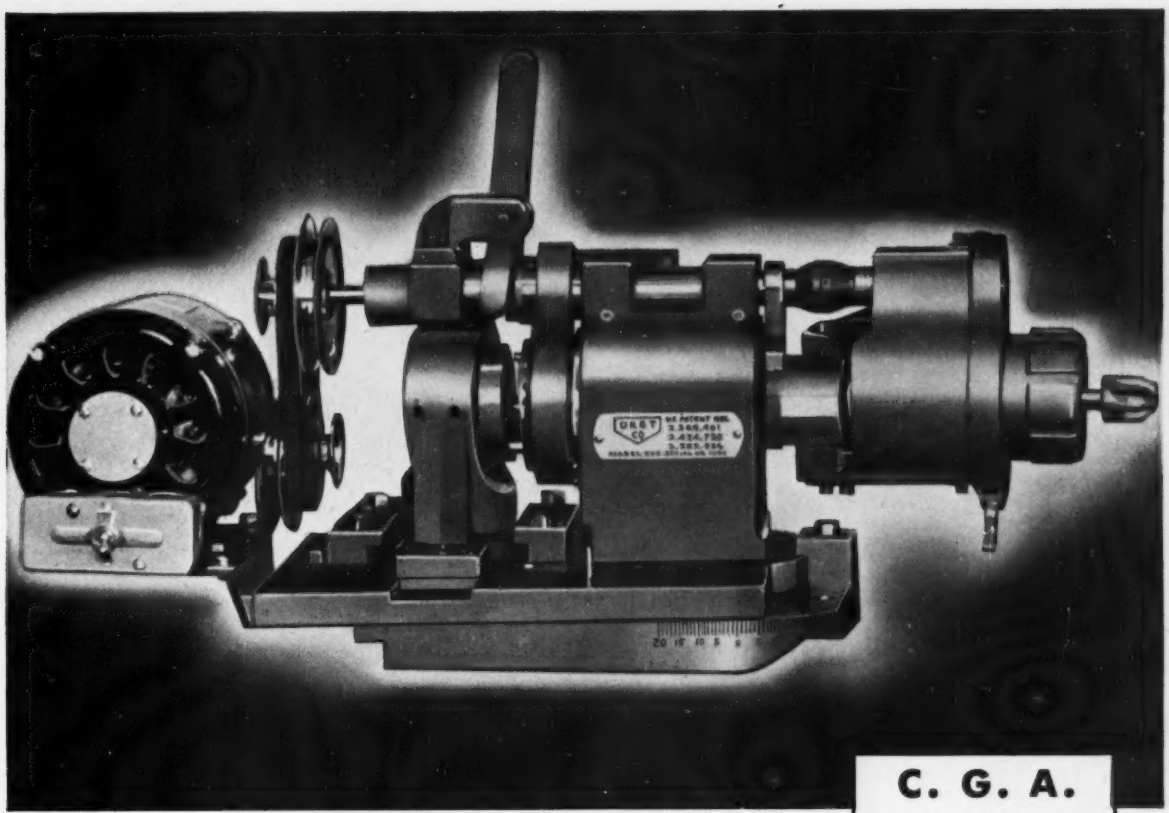
Moreover, test oil is apt to become "wet" from condensate forming in the storage tank. Before the oil can be safely reused, this moisture, too, must be eliminated.

Only when test oils are maintained ***clean*** and ***dry*** can tests be completely safe, uniform and reliable. The De Laval Oil Purifier is the most foolproof method for keeping test oils in good condition, for the centrifugal action removes ***both*** contaminants — ***dirt*** and ***water.*** No other device does this dual job so well as a centrifuge.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

PURIFIERS AND CLARIFIERS FOR FACTORY OILS



C. G. A.
MODEL 500

New CIRCULARITY. . . . . GRINDING ATTACHMENT

Detroit Reamer & Tool Company engineers, after months of intensive research and extensive development, have produced in the model 500 Circularity Grinding Attachment a new device that has many outstanding improvements. This new model is faster, easier to handle, has positive control, greater adaptability, rugged construction, and is engineered and precision built to provide the finest in precision work. Therefore, it will be of invaluable assistance to anyone whose tooling standards must meet modern production requirements.

Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, radial relief, form and radial relief together, tapered cylindrical and straight cylindrical. Cutting tool to be produced or reworked is held in collet or between dead centers and revolves on its own axial center. Where full length of spiral cutting tools is to be ground for both form and radial relief, the Circularity Grinding Attachment travel is similar to an O.D. grinder, which insures fine finish, back taper and accurate size.

DETROIT REAMER & TOOL CO.

2830 E. SEVEN MILE ROAD • DETROIT 34, MICH.

D R & T COMPANY



you can make money 2 ways on

Carlton

radial drills . . .

first

you make money by saving . . . because Carlton Radial Drills cost little to operate and maintain.

second

you make money by increasing hole production. Carlton's are designed, engineered and built to drill, ream and tap more holes per hour accurately and over a longer useful life.

yes in more ways than one, it will pay you to make your next radial drill a Carlton! Send today for descriptive bulletins.

THE CARLTON MACHINE TOOL COMPANY · CINCINNATI 25, OHIO · U. S. A.

Only one can be called the finest.

Hire these Speedy Production Triplets

better built by Black & Decker!



DRILL IT FASTER with a Black & Decker ¼" HOLGUN*

Heavy-Duty, 25% more powerful—can't be stalled at rated capacity! Only 7¼" long, ¾" spindle offset; weighs only 2¼ lbs. Unmatched for close quarter drilling in wood, metal and plastics!

TAP IT FASTER with a new Black & Decker ¼" TAPGUN*

Threads holes in steel, cast iron, brass, aluminum, 8 times faster than by hand. Only 10¾" long; weighs only 4¼ lbs. Automatic reversing mechanism greatly reduces tap breakage!

DRIVE IT FASTER with a Black & Decker No. 12 SCRUGUN*

Now 30% more powerful for increased capacity! Only 9" overall; weighs only 3¼ lbs. Positive and adjustable clutch, 90° Angle Head models.

More output, fewer rejects, less fatigue!

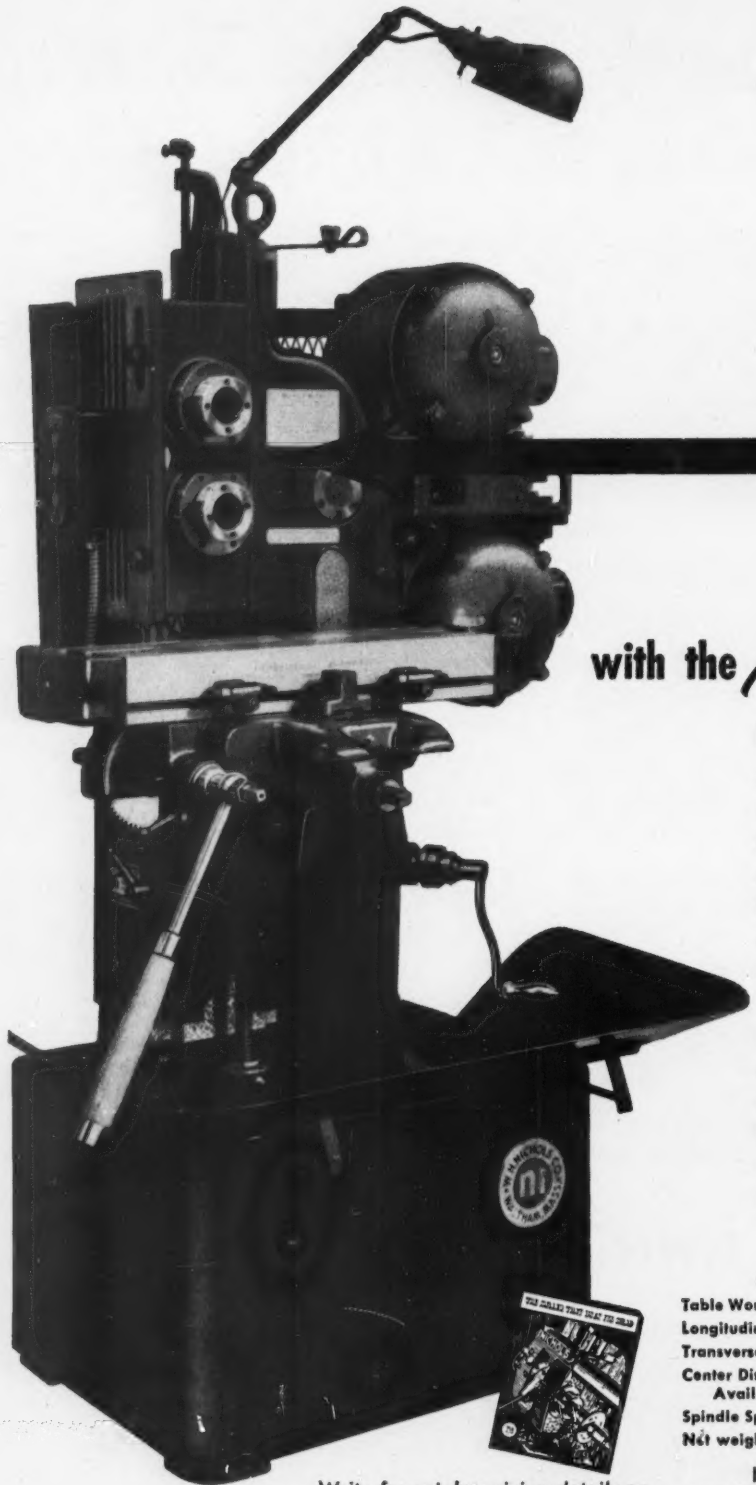
THESE fast-stepping Black & Decker production triplets have a lot in common . . . and it's all good medicine for your production schedule! They're all powered by B&D-built universal motors, tailor-made for the specific tools they drive. They're all perfectly balanced and matched in design, with the famous "Pistol Grip and Trigger Switch" to give you easier handling, less worker fatigue. They're all engineered to turn out more uniform work at lower cost with fewer rejects. And they're all packed with the strength and stamina that Black & Decker builds into every part, every tool!

Find out how these production triplets can save you money, muscle and man-hours. See your nearby Black & Decker Distributor for a demonstration. Write for free catalog of over 100 Electric Tools to: THE BLACK & DECKER MFG. CO., 605 Pennsylvania Ave., Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

LEADING DISTRIBUTORS EVERYWHERE SELL

B&D Black & Decker PORTABLE ELECTRIC TOOLS



TWO FOR ONE

with the *Nichols* Double-Decker!

The Nichols *"Double-Decker"* Two-spindle Miller actually gives you *two* milling operations in *one* pass! It is equally adaptable to small or large lot production of small parts where parallel flats or grooves, or opposed faces cannot be straddle milled, or otherwise must be indexed for two operations with a single cutter. Its time-saving features are readily apparent. Spindles may be separated from 4" to 7" (or more) to accommodate various sizes of cutters and work. Table can be arranged for hand operation or with automatic work cycle, and with high or low spindle speeds.

CONDENSED SPECIFICATIONS

Table Working Surface	6¾" x 21"
Longitudinal Travel	10"
Transverse Travel	7"
Center Distance of Spindles Available Between	3¼" and 14⅛"
Spindle Speeds Available	up to 5000 R.P.M.
Net weight approx.	1250 lbs.

Inquiries must be submitted in detail, as specifications and capacities are governed by user's needs.

Write for catalog giving details on lever, screw and air-feed models, plus three types of double spindle Nichols Millers.

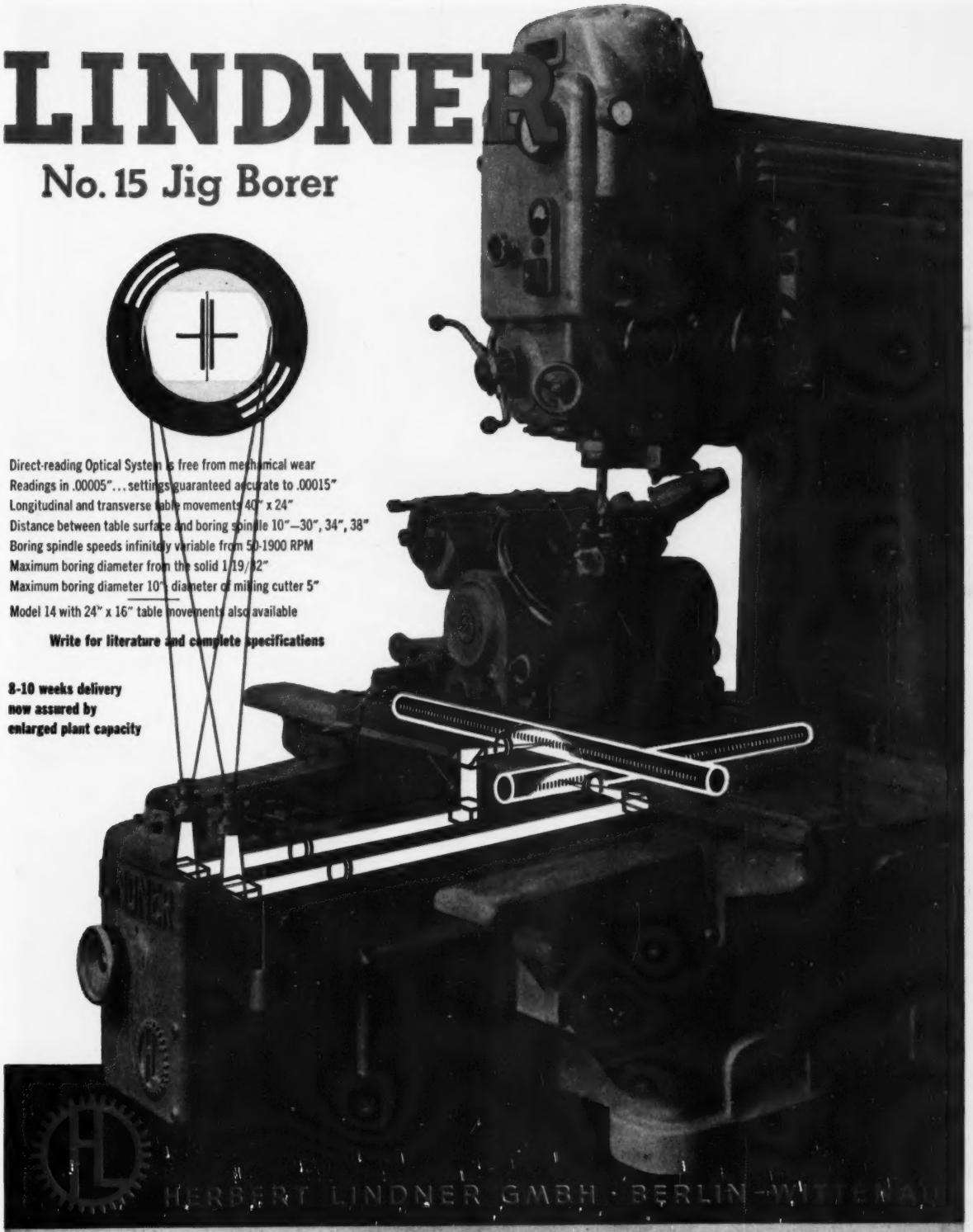
MANUFACTURED BY W. H. NICHOLS COMPANY WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS **NICHOLS-MORRIS CORPORATION**

76-E MAMARONECK AVE.
WHITE PLAINS, N. Y.

LINDNER

No. 15 Jig Borer



Direct-reading Optical System is free from mechanical wear
Readings in .00005"... settings guaranteed accurate to .00015"
Longitudinal and transverse table movements 40" x 24"
Distance between table surface and boring spindle 10"—30", 34", 38"
Boring spindle speeds infinitely variable from 50-1900 RPM
Maximum boring diameter from the solid 1 19/32"
Maximum boring diameter 10"; diameter of milling cutter 5"

Model 14 with 24" x 16" table movements also available

Write for literature and complete specifications

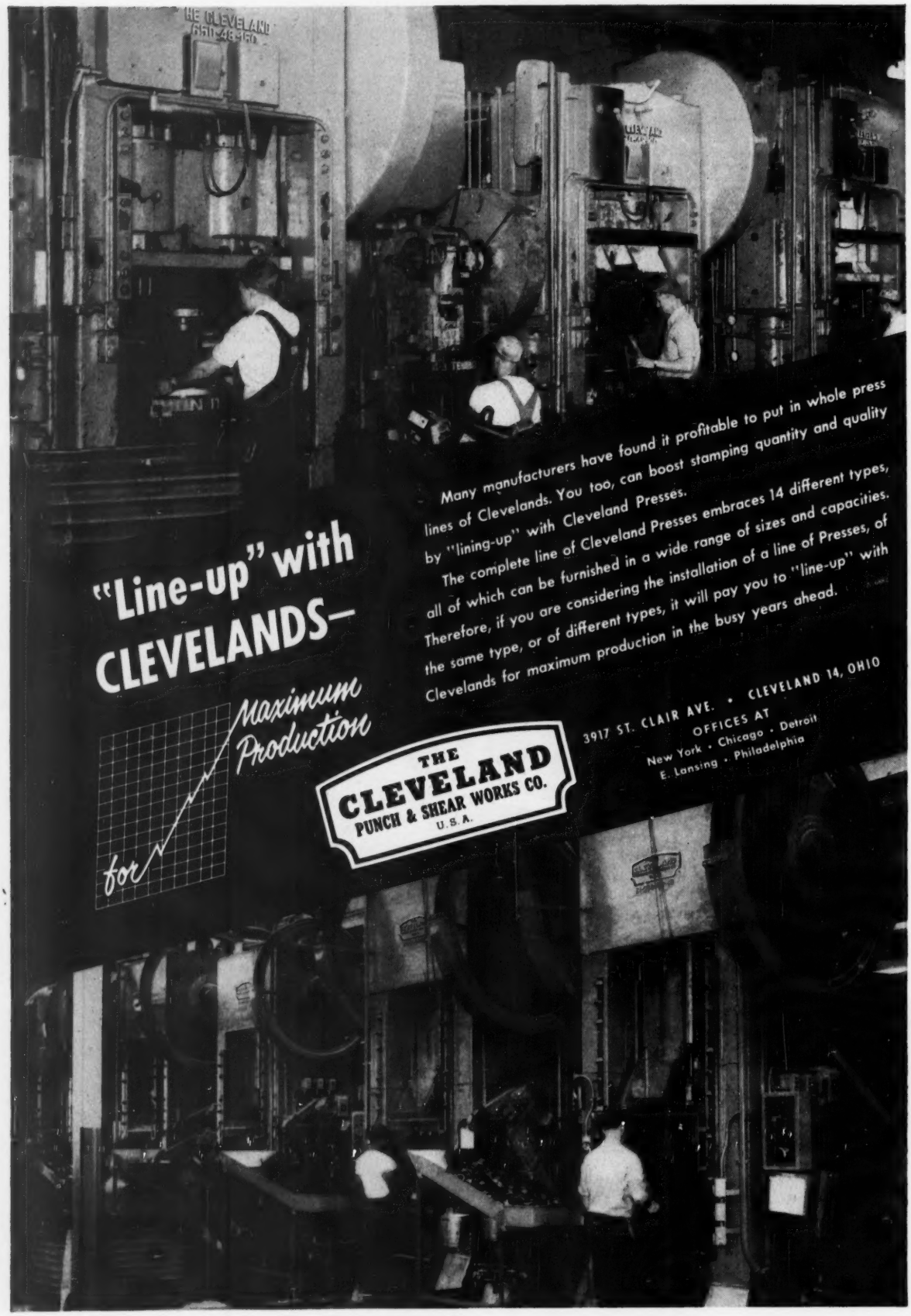
8-10 weeks delivery now assured by enlarged plant capacity

KO CO., INC. INDUSTRIAL IMPORTERS

KURT ORBAN

COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Avenue, Cleveland 3


"Line-up" with CLEVELANDS—
for Maximum Production
Many manufacturers have found it profitable to put in whole press lines of Clevelands. You too, can boost stamping quantity and quality by "lining-up" with Cleveland Presses.
The complete line of Cleveland Presses embraces 14 different types, all of which can be furnished in a wide range of sizes and capacities. Therefore, if you are considering the installation of a line of Presses, of the same type, or of different types, it will pay you to "line-up" with Clevelands for maximum production in the busy years ahead.
THE CLEVELAND PUNCH & SHEAR WORKS CO. U.S.A.
3917 ST. CLAIR AVE. • CLEVELAND 14, OHIO
OFFICES AT
New York • Chicago • Detroit
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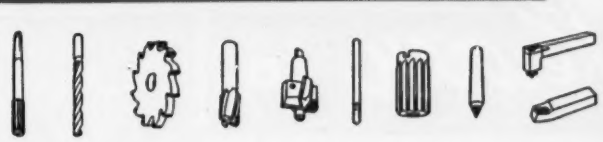
STANDARD CARBIDE MILLING CUTTERS

From The World's Most Complete Stock of Standard Carbide Tools

STC



Ask for catalog listing all Super Standard Carbide Tools.

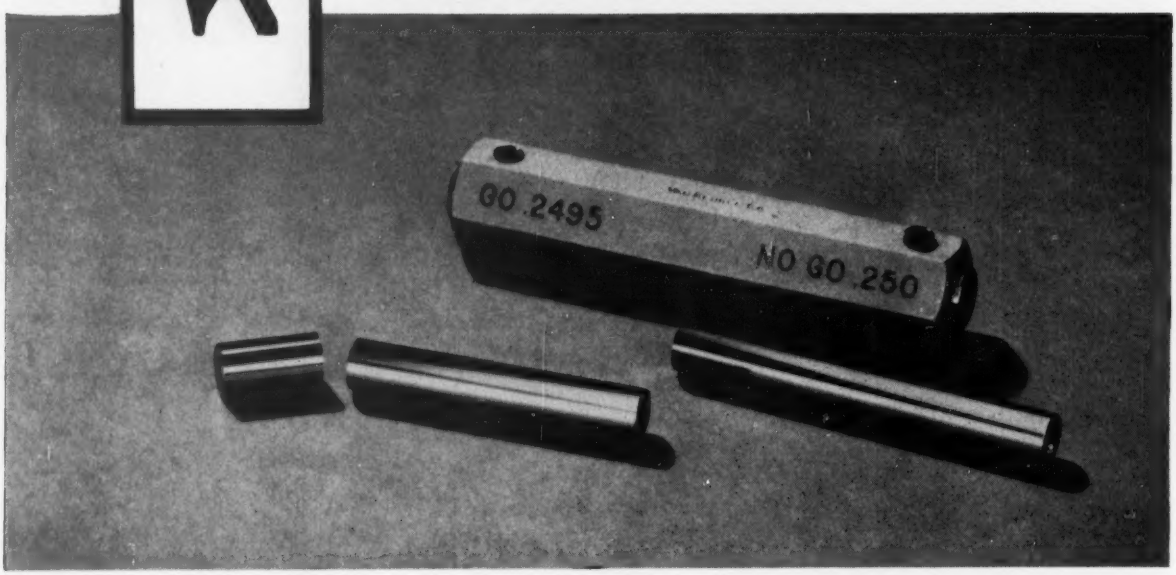


QUALITY CARBIDE TOOLS

Super TOOL COMPANY

21650 Hoover Road, Detroit 13, Michigan also 5210 San Fernando Rd., Glendale 3, California

VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED and MONEY-SAVERS

because they're "Cut-off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able". And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below 3/8" may be cut off when ends become worn and as many as from five to ten gages made available from the 1 7/8" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog and Handbook No. 35, available on request by writing to: The Van Keuren Co., 178 Waltham Street, Watertown, Mass.

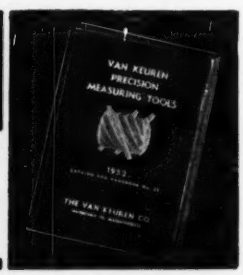
VK

34th YEAR

THE Van Keuren CO.

178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires



American Felt TREATMENTS GREATLY EXPAND FELT'S FUNCTIONS

Just see this list of the treatments that can be given to felt by American. They tremendously increase the usefulness and value of felt, giving it new and added qualities and advantages. Especially treated felt from American may be the answer to one or more of your problems associated with either your production or your product. Remember that felt is an engineering material, which can be specified as accurately as any other. It can be had in rolls, sheets or cut or formed parts to your exact specifications. American's Engineering and Research Department will gladly collaborate with your engineers, designers and production men. Write on your company letterhead for:

Data Sheet No. 4, Special Felt Treatments.

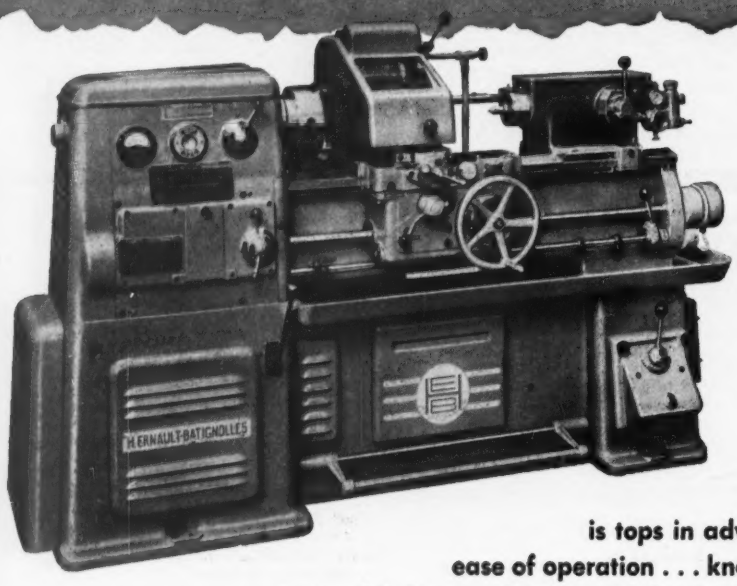


Felt Treatment Selection Chart

TREATMENT INDEX	DESCRIPTION	TYPICAL USE
SIZING IMPREGNATIONS		
No. 1 Starch Base	Slight Stiffening	Coat Front Felts
No. 2 Starch Base	Medium Stiffening	Shoe, Tongue, and Pennant Felts
No. 3 Starch Base	Stiff Size	Millinery, Furrier, and Heel Pads
No. 4 Starch Base	Extra Stiff Size	Hat Brims
No. 5 Starch Base	Double Stiff Size	Carnival Hats
Starch Base	5% to 30% Dry Solids	Stiffening
Synthetic or Natural Resin Emulsions	5% to 30% Dry Solids	Permanent Stiffening – Pre-Form Molding
TREATMENT IMPREGNATIONS		
Asphalt – Water Dispersed	Weather Sealing	Cowl Seals – Anti-Squeak Chassis Strips
Graphite – Water Dispersed	Lubrication	Anti-Friction Lubricating Pads – Washers – Oil Seals
Paraffin – Petrolatum (Cut Parts Only)	Waterproof Sealing - Lubrication	Float Valve Plunger Washers – Needle Lubricating Pads
Paraffin – Graphite - Petrolatum (Cut Parts Only)	Packing - Lubrication	Marine Stuffing Box Washers
Wax – Bee's - Carnarba - Candelilla - Paraffin (Cut Parts Only)	Blocking - Sealing	Polishing Laps – Waterproofing
Natural Latex Hycar Latex Neoprene Latex Buna-S Latex	5% to 100% Dry Solids Flexible Stiffening, and strengthening	Backing Felts, Cushioning Type of Latex used dependent on conditions of use
Flame Resistance	Felt treated to specification will not propagate a flame	Aircraft and decorative felts, Clothes Dryer Felt
Fungi Resistance	Will not support fungus growth	As required by conditions of use
Flame and Fungi Resistance	Will not support Fungus Growth – Will not propagate a Flame	Felts for Acoustical and Thermal Insulation
Water Resistance	Minimum Water Absorption	Weatherstripping
Moisture - Fungi Resistance	Treated to Government Specification – Felt has Minimum Water Absorption and Will Not Support Fungus Growth	Tropicalization
Vermin Resistance	Felt non-attractive to insects	Musical or Scientific Instruments, Case Lining Felt
Moth Resistance	Resistant to carpet beetle larvae ravage	Musical or Scientific Instruments, Case Lining Felt
LAMINATIONS		
Hycar Sheeting Neoprene Sheeting Buna-S Sheeting	1/32" T and 1/64" T Impervious Septums Laminated to all Felt Densities	Oil or Water Seals, The Impervious Rubber Sheeting Functions As a Positive Dam
Hycar Rubber Vistex Natural Rubber Vistex Neoprene Rubber Vistex Buna-S Rubber Vistex	A Sheet, Laminated, Felt Base Packing, Sealing and Gasketing Material	Fuel Pump Packing Washers, Mechanical Seals for Corrosive Liquids, Oil Wipers, Shock Absorber Packing
Aluminum Foil	Laminated to Pad Felts or Special "K" Felt	Reflectant, Acoustical and Thermal Insulating Blankets
COATINGS		
Latex Rubber Surface Coating (One or Both Sides)	Reinforcement, non-skid	Reinforce low grade pad felts, non-skid typewriter pads, non-skid chair pads
Rubber and Starch Sizing Coating	Stiff Reinforcement	Window Channel Felt

Production tested and approved in over 1,000 plants





HIGH SPEED HYDRAULIC COPYING LATHE

Those who have *compared* copying lathes know the H.E.B. is tops in advanced design, construction and ease of operation . . . know that the H.E.B. means faster, trouble-free production with better finish, no distortion of the work.

The H.E.B. Copying Lathe has higher spindle speeds—up to 3600 RPM in the **OP Models** to take full advantage of carbide. **GT Models** with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

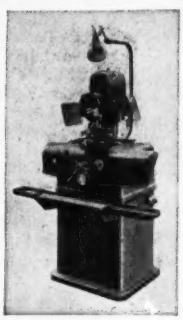
You won't find *chips* any problem at all. A sloping bed together with a built-in coolant pump result in automatic wash-away of the chips into a rear pan, from which they are easily removed *without stopping the machine.* Featured too are the power operated back tool posts which are part of the standard machine.

Remember, the H.E.B.'s patented copying device is an integral part of this ruggedly constructed lathe, resulting in rigidity and accuracy. Setting time is reduced to a handful of minutes, and finished parts are copy-turned up to 300% faster than on multi-tool lathes.

Designed and built in France by H. Ernault Batignolles—machine tool manufacturers for almost a hundred years!

If you are planning to make an investment in a copying lathe you want the best . . . Study our insert in Sweet's Machine Tool Catalog—Or write or phone us for detailed catalog or a demonstration!

TYPE 178 CONSTAN CARBIDE TOOL GRINDER



Specially designed for carbide tools without attachments. Heavily built, the Constan combines smooth operation and ease of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the tool may be clamped in any position. Two diamond wheels are mounted on the wheel head, and each may easily be brought into position.

H·E·B
"THE WAY TO TURN"

IMMEDIATE DELIVERY

H. E. B. MACHINE TOOLS, INC.
475 FIFTH AVENUE • NEW YORK 17, N. Y.
Telephone: LExington 2-0266

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

are you still running nuts one-at-a-time?

Ingersoll-Rand Multiple Nut Runners have increased output 70% over single power wrenches.*



For years multiple drilling, tapping and reaming have saved time and dollars. . . . Now you can tool for increased savings with Ingersoll-Rand *Multiple Nut Runners.*

MULTIPLE NUT RUNNERS GIVE YOU:

- 2 or more nuts driven at once . . . in the time formerly required to drive one.
- Good "quality control." . . . Torque is uniform on each and every nut.
- Safe Operation for operator. . . . Torque reaction is non-existent.
- Immediate on-the-job operation. . . . No special training needed for the operator.
- Low Maintenance. . . . Units in service show maintenance savings up to 50%.

All Ingersoll-Rand Multiple Nut Runners are built to your specifications. Our power-tool application engineers will gladly go over your nut running jobs with you and make their recommendations—there's no obligation on your part. Send for Bulletin 5099.

***Here's Nut Running History in the making!**

The times below from the records of a leading car manufacturer are based upon 1000 units of comparable nut running operations.

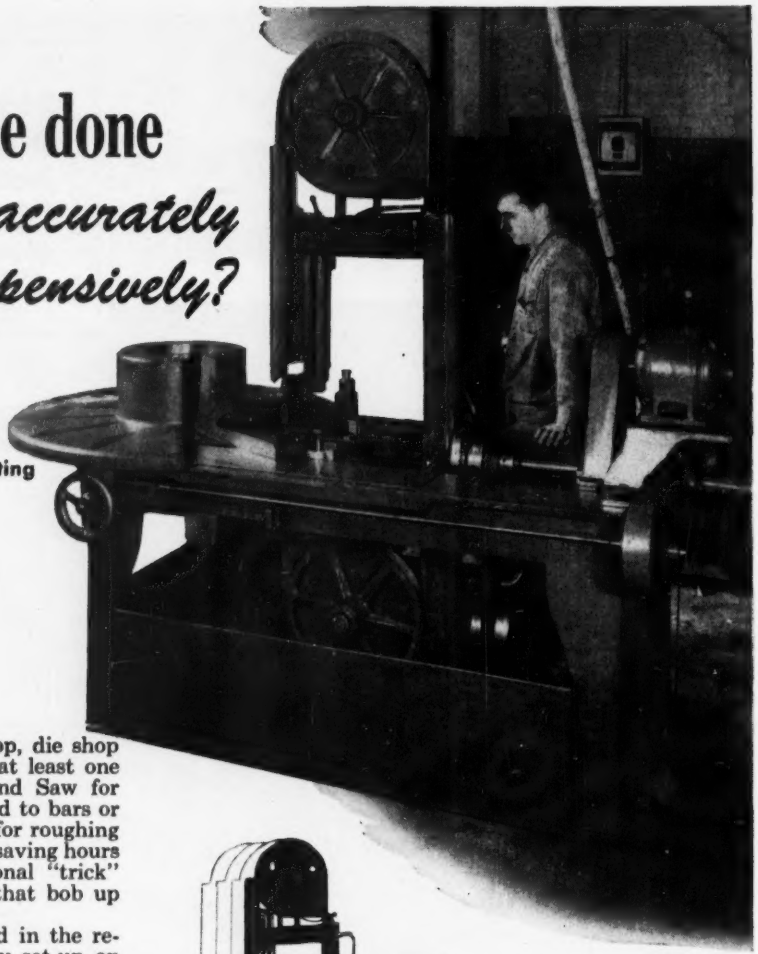
1912	Hand Wrench	200 Man Hrs.
1917	Speeder Wrench	100 Man Hrs.
1928	Single Power Wrench	50 Man Hrs.
1952	Multiple Nut Runner	14 Man Hrs.

COMPRESSORS • AIR TOOLS • ROCK DRILLS
TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS
DIESEL AND GAS ENGINES

Ingersoll-Rand
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How else could this job be done

so easily, so accurately and so inexpensively?

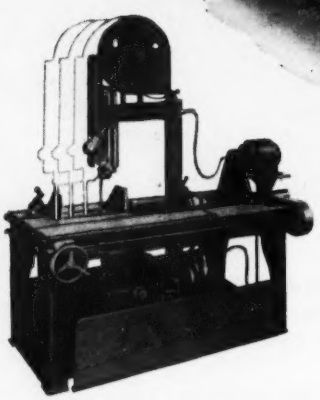


Segmentation of 42" Steel Casting

Every tool room, machine shop, die shop and maintenance department needs at least one No. 8 MARVEL Metal-cutting Band Saw for cutting off anything from ¼" drill rod to bars or billets of 18" x 18" cross-section . . . for roughing large work to size and shape, thereby saving hours of machining . . . for those occasional "trick" jobs, impossible on any other saw, that bob up in every plant.

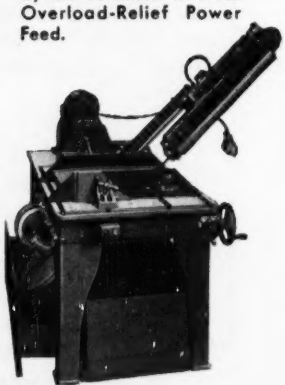
Odd shapes that can't be held in the removable, quick-action vise, are easily set-up on the No. 8's large, T-slotted work table. MARVEL Overload-Relief Power Feed insures accurate cuts under the most adverse conditions because blade pressures are automatically held within limits which are pre-set instantly for each job. The blade is never forced beyond its capacity to efficiently and accurately remove metal . . .

Close limits are further assured through the work being clamped rigidly to the bed of the saw and the blade power-fed through it instead of pushing the work through the blade. This is also true in miter cutting, as the blade column—*not the work*—is swung to the required angle. The handiest, most versatile machine tool, it is also the busiest in most shops.



This double exposure illustrates how the blade maintains its vertical position while moving into and through the work, impelled by the automatic MARVEL Overload-Relief Power Feed.





Column set at angle to cut 45° miter on 18" beam. Entire saw column can be swung to cut at any angle from vertical to 45° right or 45° left.

MARVEL *Metal Cutting* **SAWS**

Better Machines–Better Blades

Write for Catalog

ARMSTRONG-BLUM MANUFACTURING CO.

5700 Bloomingdale Avenue *"The Hack Saw People"* **Chicago 39, U. S. A.**

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVE DISCS

See Discs, Abrasive.

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grant St., New York 13, N. Y.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

ALLOYS, Magnesium

Dow Chemical Co., Midland, Mich.

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES

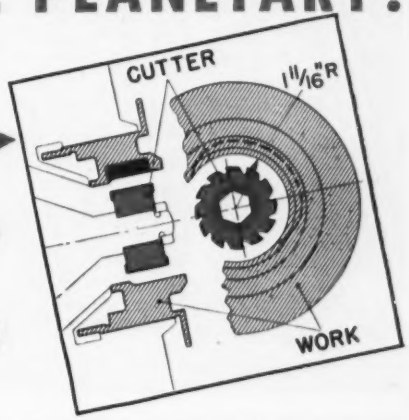
See Presses, Arbor.

ARBORS AND MANDRELS

Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Grand Tool & Supply Co., 172 Grand St., New York 13, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

(Continued on page 282)

another job for the HALL PLANETARY!



Milling radial pockets of different sizes in heat-treated steel!

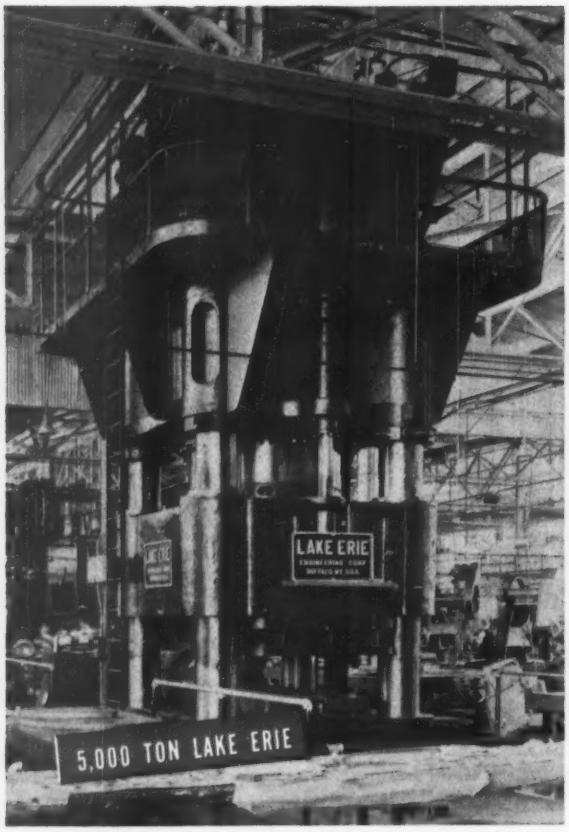
Here's a job that the Hall Planetary principle makes easy! Planemilling a pocket equal to the radius of the cutter and ½" deep on one side of a bore and milling another pocket approximately 90° long opposite the first pocket in a separate Planetary operation. In the Hall Planetary the planetary movement is obtained by rotating eccentric containers. The spindle on which the cutter is mounted rotates within these eccentrics and moves in a circular arc from center, entering the work near the extreme of the eccentric. In the job shown, the length of the cut is accurately controlled, after which the cutter automatically returns to center to complete the cycle.

Handling of a job like this is further simplified because the work is held stationary. This feature is especially valuable in the handling of parts which, because of their shape or size, are difficult to rotate. In addition, because the work fixture is secured to the head, rigidity is easily maintained and a high degree of accuracy is assured.

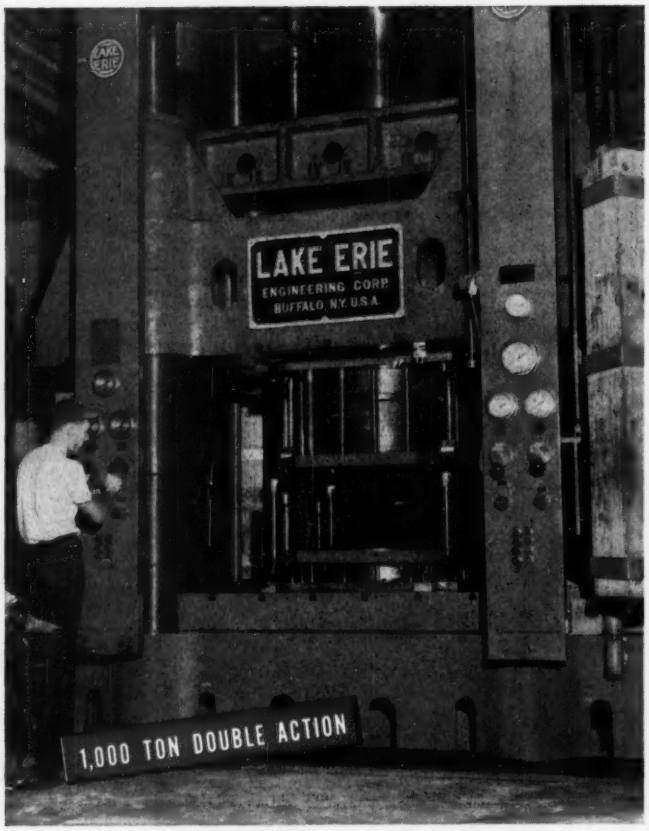


THE HALL PLANETARY COMPANY

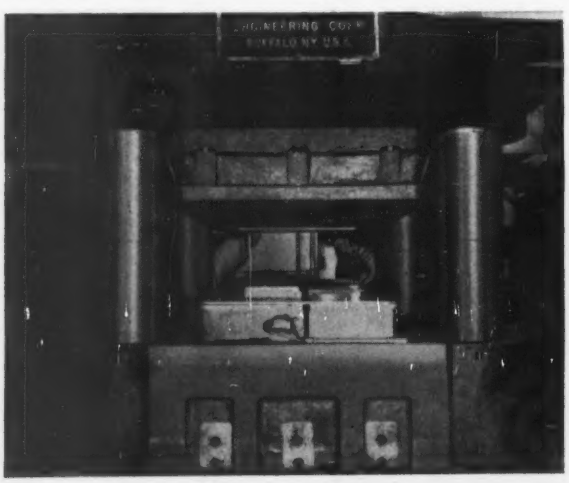
Lake Erie Hydraulic Presses play



THE "BIG" PRESS AT CHANCE VOUGHT is a 5,000 ton Lake Erie fitted with a rubber pad. Press is shown forming four parts in a single operation. Two are for Chance Vought's F7U Cutlass fighter and two are for a Lockheed subcontract. Material used is 24 S O Aluminum of .051 gauge.



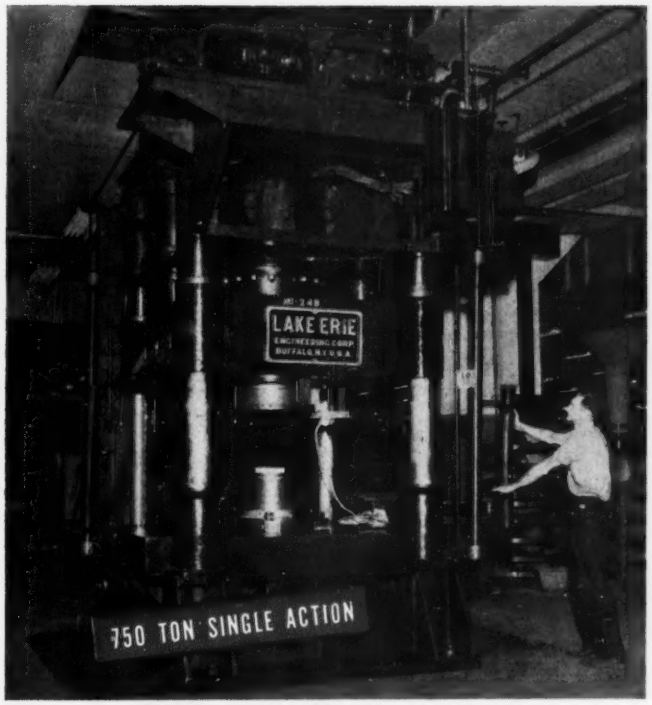
CHANCE VOUGHT'S 1,000 TON LAKE ERIE is shown forming a jet oil tank part under a contract with Pratt & Whitney Aircraft Company. The parts are formed from Aluminum. Lake Erie presses produce hundreds of different parts for Chance Vought.





Over 75% of all U.S. aircraft manufacturers utilize Lake Erie equipment

a Leading Part in the production of Chance Vought Aircraft



THIS 750 TON PRESS illustrates the versatility of Lake Erie hydraulic equipment. It is being used in this instance for an experimental setup employing very high forming pressures. The wires are connected to electrical strain gauges to insure that the S O Aluminum is not overstressed.



● **Wide-variety of parts for famous Corsair and Cutlass fighters, and for subcontractors, is produced on Lake Erie Equipment.**

PICTURES TELL THE STORY

The wide use of Lake Erie Hydraulic Presses by Chance Vought is a typical aircraft industry practice. Over 75% of all U. S. aircraft manufacturers utilize Lake Erie equipment. With the most complete line of hydraulic presses to choose from... over 3,500 designs from 5 to 22,000 tons capacity... and the most extensive experience in the aircraft industry, Lake Erie is the logical one to consult about your hydraulic press needs. Our experienced engineers will be glad to discuss your requirements. No obligation, of course.

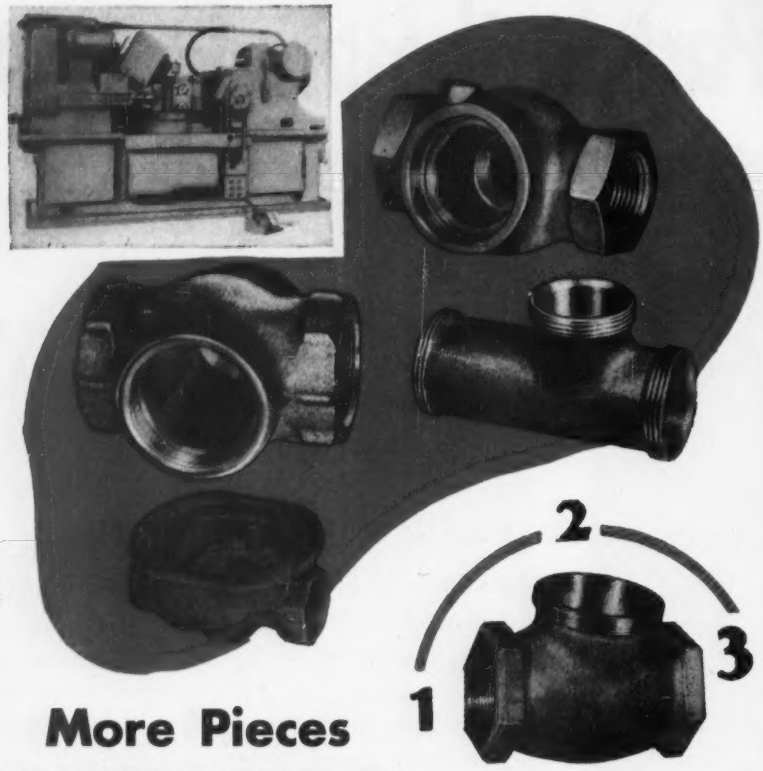
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Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Kennametal, Inc., Latrobe, Pa.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

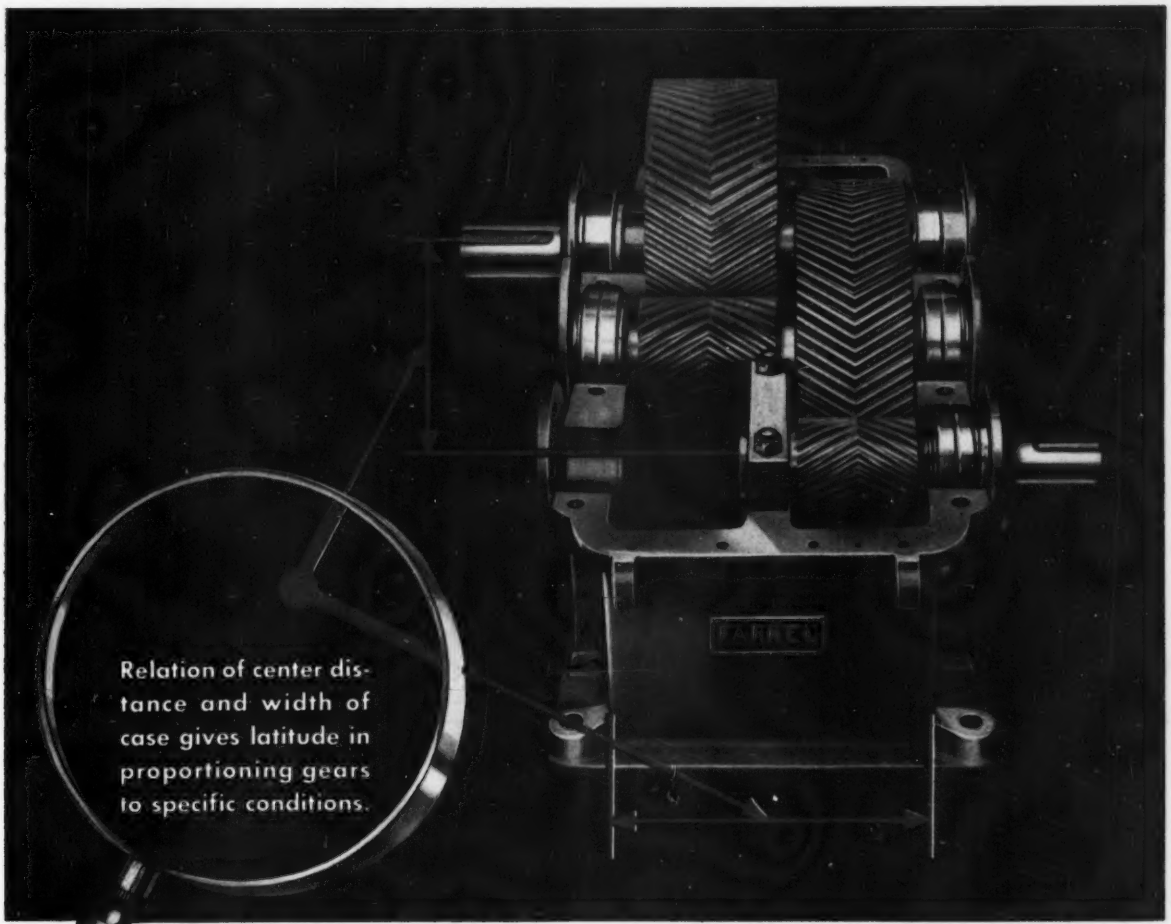
BEARINGS, Babbitt

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Ball

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
New Departure Div., General Motors, Bristol, Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Torrington Co., Torrington, Conn.

(Continued on page 284)



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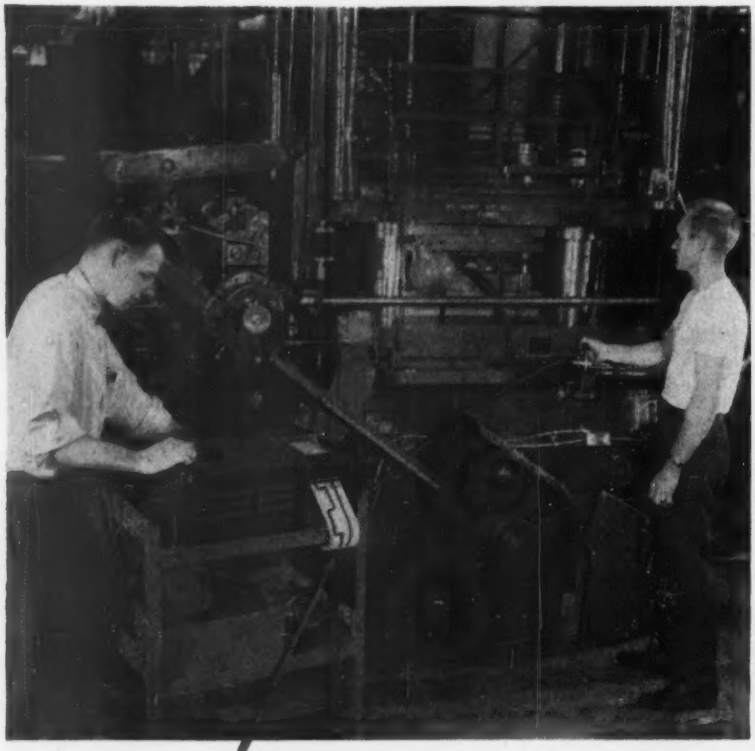
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Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

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Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Shafer Bearing Corp., Downers Grove, Ill.
S K F Industries, Inc., P. O. Box 6731, North Philadelphia, Pa.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockford Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
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Torrington Co., Torrington, Conn.

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Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Shafer Bearing Corp., Downers Grove, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

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(Continued on page 286)

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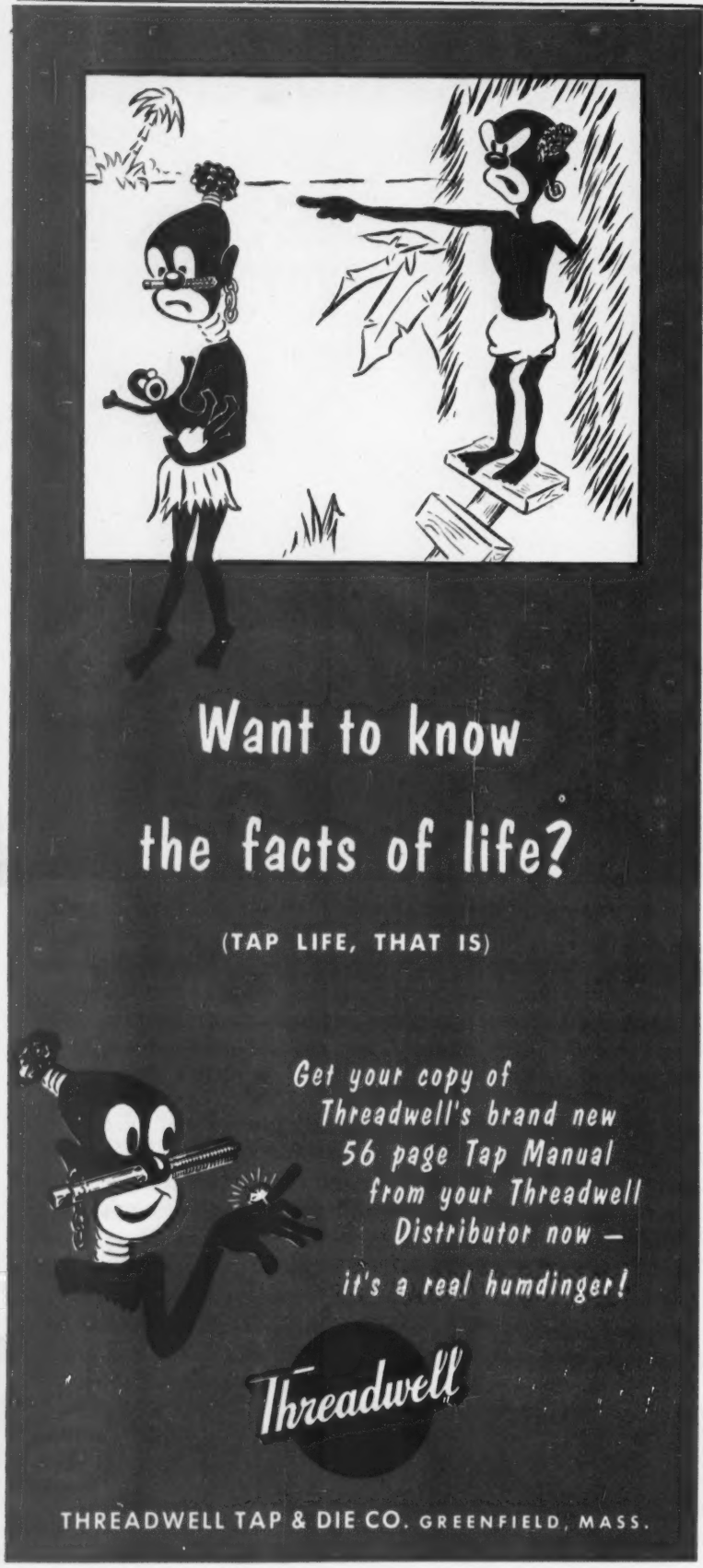
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O'Neil-Irwin Mfg. Co., Lake City, Minn.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., & Co., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Farquhar, A. B., & Co., 21 Duke St., York, Pa.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT

Leiman Bros., Inc., 156 Christie St., Newark, N. J.
Pangborn Corp., Hagerstown, Md.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Leiman Bros., Inc., 156 Christie St., Newark, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

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Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
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National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
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(Continued on page 288)



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BORING AND DRILLING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

BORING BARS

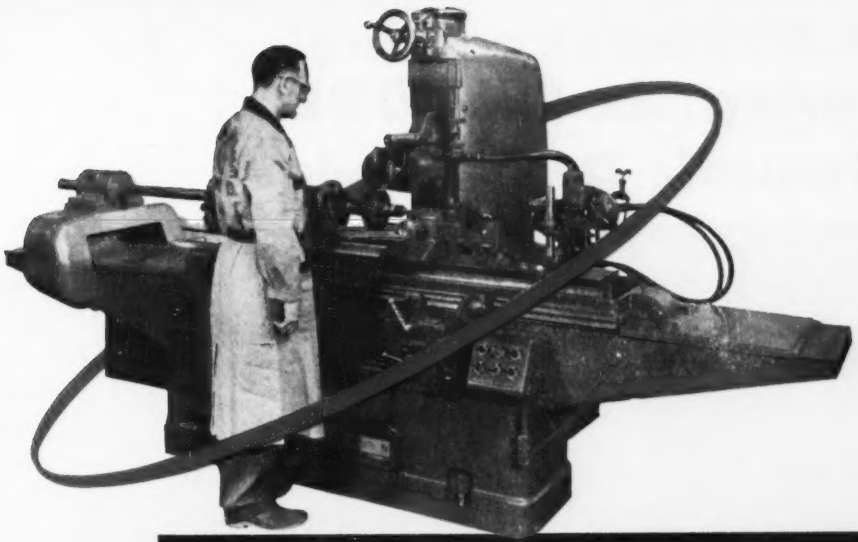
Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Homestrand, Inc., Larchmont, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Madison Mfg. Co., Muskegon Heights, Mich.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Universal Engineering Co., Frankenmuth 2, Mich.

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Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R., Evanston, Cincinnati, Ohio.

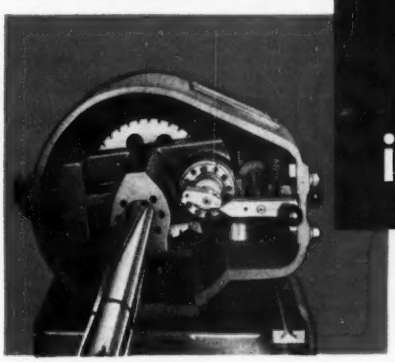
(Continued on page 290)



NEW HELICAL GEAR AND SPLINE GRINDER

Assures Highest Accuracy in both Lead and Tooth Form

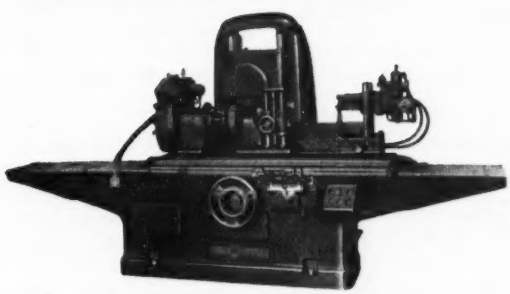
Indexing mechanism of the Helical Grinder



The new Red Ring Helical Gear and Spline Grinder, Models SGF-12" and 18", incorporate the lead bar principle thus eliminating the inherent errors, human and mechanical, of conventional methods heretofore used to maintain specific lead or helix angle.

The lead of every gear tooth or spline is exactly alike—exactly the same as that of the precision ground master lead bar which rigidly controls the progressive rotation of the work part as it is traversed under the grinding wheel.

The grinding wheel is dressed to any desired tooth form. That form is controlled by a hardened steel master form plate which guides the movement of the dresser diamonds.



Red Ring Spur Gear and Spline Grinder, Models SGD-12" and SGC-18"

Write for descriptive folder on Red Ring Gear and Spline Grinders both helical and spur.

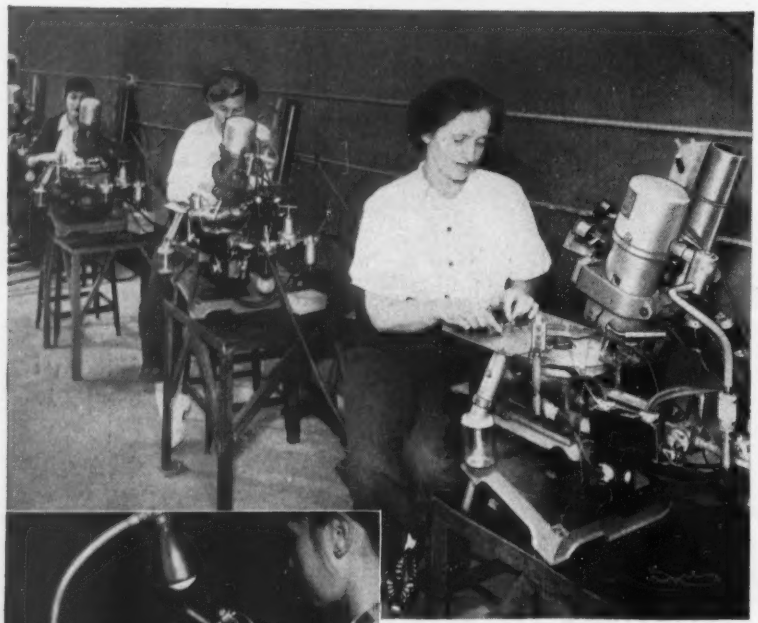


NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

124,800 holes per day! ... using six DUMORE Automatic Drill Heads



Parts are hand loaded in an automatic indexing rotary table with 24 stations. Peak production has reached 23,000 pieces.



A Dumore Precision Drill Grinder is used to sharpen drills after a full day's production. Maximum drill life per grind has reached 23,000 holes.

Get amazing cost-reducing benefits with DUMORE tools

TALK about amazing production! One west-coast manufacturer uses six *continuous running* Dumore Automatic Drill Heads to drill tiny brass parts — at the rate of *20,800 per head per day*. The job calls for a No. 71 drill (dia. .026") and hole depth of .069". In addition to the amazingly high production, the user reports that the Dumore Automatic Drill Heads slash costs of drill breakage, down-time and scrap loss.

Amazing, too, are the results this company achieves using a Dumore Precision Drill Grinder to sharpen their drills for this job. They actually get a maximum of up to 23,000 holes per sharpening. That means a full day of continuous production for every Dumore sharpened drill, *without stopping to regrind*.

Get all the information about these tools — their capacity to increase small hole production — to eliminate operator guesswork — to provide completely automatic control. Ask your nearby industrial distributor for a demonstration, or write:

THE DUMORE COMPANY
1343 Seventeenth Street • Racine, Wisconsin

Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Portage Machine Co., 1069 Sweitzer Ave., Akron 11, Ohio.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Mummert-Dixon Co., Hanover, Pa.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.

BORING TOOLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit Wis.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.

(Continued on page 292)

another reason why owners say —

"We use the VERS-O-TOOL SYSTEM"



They call it a "system" because, among other exclusive features, Vers-o-tools are provided with a patented Namco Micrometer that takes the guess-work out of chaser grinding.

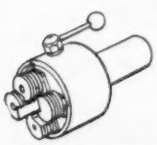
No trial cuts, no adjustments, no time or scrap loss. And by providing an extra set of chasers, kept ground in the toolroom and ready, you put long run jobs on a continuous production basis. Time saved by using this gage frequently adds thousands of precision threads—reduces your costs.

Other Advantages of the System

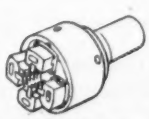
Standard Vers-o-tools use either the famous ground thread circular chasers or the lower cost, adjustable-blade, ground thread chasers—interchangeable die size for die size, in both revolving and non-revolving self-opening heads. The same system applies for end forming and end turning cutters. Use of knurls and rolls is common practice.

Once you start using Vers-o-tools, you are immediately equipped for a more versatile use of threading equipment, at a lower tool investment, than is possible from any other source.

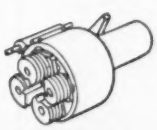
Ask for DT-52, complete new catalog on Vers-o-tool and Namco Solid and Collapsible Taps.



Style DS Vers-o-tool (Non-revolving Type) 10 Sizes, ⅜"—6½".



Style DR Vers-o-tool (Revolving Type) 13 Sizes ⅜"—6½" Shown with Adjustable Blade Chasers 7 Sizes, ⅜"—2".



Style DBS Vers-o-tool (for B&S Automatics) 3 Sizes, ¼"—⅝".

Patented NAMCO MICROMETER

takes the guess-work out of chaser grinding

THIS IS THE WAY IT WORKS:

★ Remove chasers from Vers-o-tool head (in one minute) and take a micrometer reading.

★ Regrind them to the same micrometer reading. (Perfect control of the grind is automatic through serrated mounting of circular chasers—rechecking on the gage proves their uniformity.)

★ Replace chasers in head (one minute) with *certainty* that they will cut threads *identical* to those cut on previous grinds.

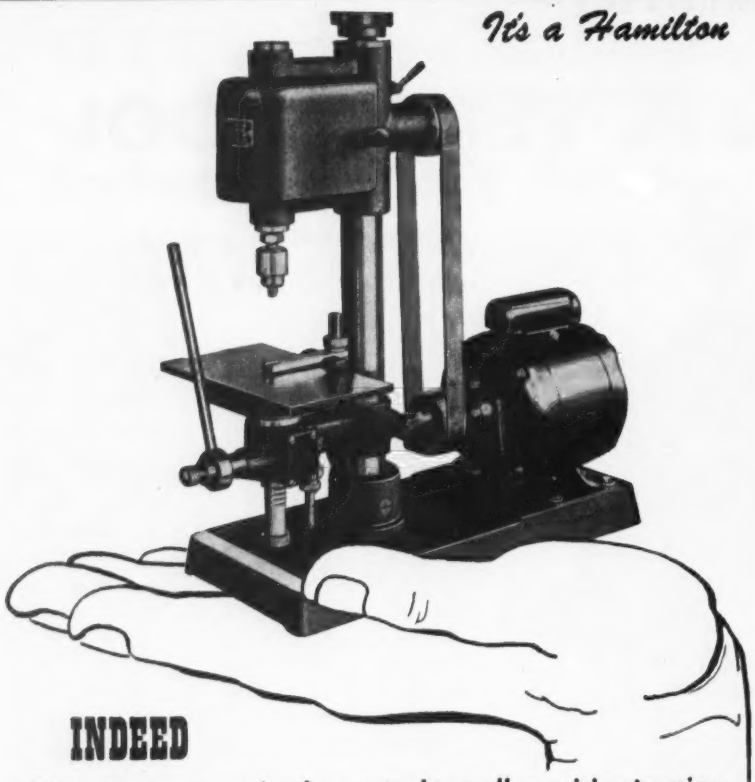
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The NATIONAL ACME CO.

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The complete story of this machine is told in our Bulletin T-471.

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McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
OK Tool Co., Milford, N. H.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

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Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
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Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Peck, Stow & Wilcox Co., Southington, Conn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.
duMont Corp. (Hand, for keyway cutting), Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

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Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co, Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Johnson Bronze Co., New Castle, Pa.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUFFERS

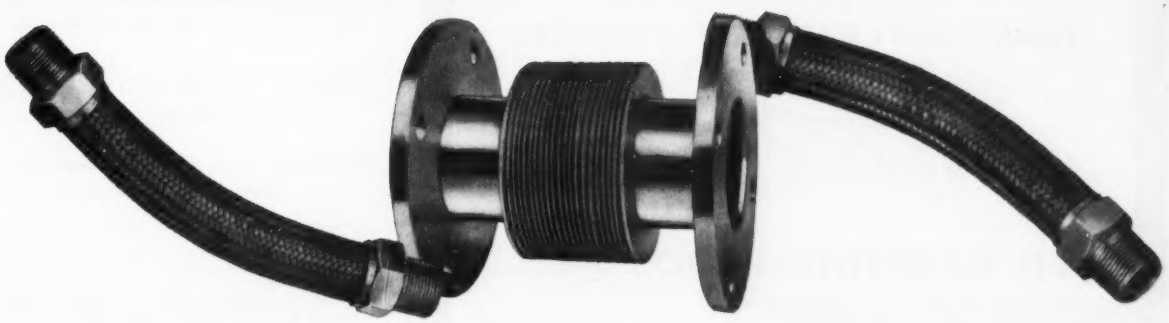
Black & Decker Mfg. Co., E. Penna. Ave, Towson, Md. (Portable Elec.).
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

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Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
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Atrax Co., Newington, Conn.

(Continued on page 294)

Are these 3 new to you?



It would pay you to know all about them

Don't let their modest appearance fool you; these are puzzle-busters and job-simplifiers extraordinary.

This is **TITEFLEX®**—*the* All-Metal Flexible Hose with 1001 industrial applications. It withstands temperatures, pressures, vacuum, vibration and the corrosive action of a host of liquids and gases. How can you use it? To connect moving parts of machinery. To connect misaligned parts. To absorb vibration, contraction, expansion and pulsation. To "transmit" vacuums or convey high-frequency currents. To shield wire and cables. And to handle difficult materials—from acid and ammonia to sea water or steam.

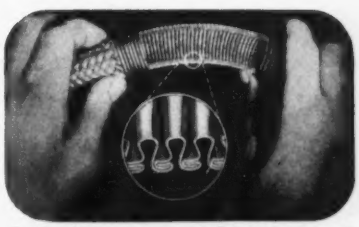
Here's **UNIFLEX**—the new *Helically-corrugated* Seamless Flexible Tube. It's tough, corrosion-resistant, leak-proof. And its *helical* construction gives it greater flexibility and longer life in applications too critical for ordinary concentric tubing. UNIFLEX is for you—if you're concerned with hydraulic lines, oil burners, refrigeration machinery, air conditioning equipment, pumps, compressors, diesels or machine tools. For leakless service, UNIFLEX fittings have metal-to-metal seat. Seal is produced through spring washer effect of hose on fitting body.

TITEFLEX BELLOWS are the *efficient* means of absorbing lineal movement in many types of equipment. Their welded, convoluted-diaphragm construction lets them do this without weakening the lines in which they are inserted and without reducing the flow rates of gases or liquids being conveyed. You can use TITEFLEX BELLOWS to seal high pressure valves and shafts, accommodate lineal contraction and expansion or high frequency vibration, and to handle gases and corrosive liquids under high temperature conditions. Special designs are available and complete bellows assemblies can be furnished with any required types of fittings.

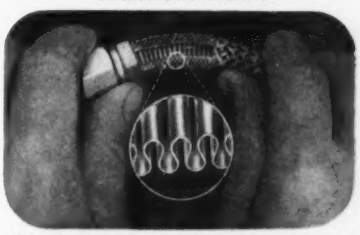


Get the facts without obligation

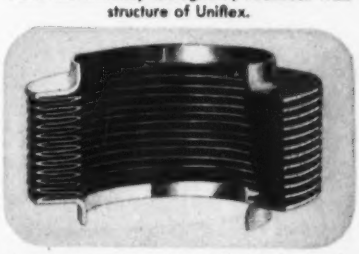
TITEFLEX literature contains full descriptions, technical data and suggestions for use. And Titeflex Designers and Engineers have a thorough knowledge of these products' behavior under exacting service conditions. Check the products that interest you and mail the coupon today. We'll be glad to help you with any specific problem.



Sectional view shows rugged, flexible, seamed construction of Titeflex.



Note the helically-corrugated, seamless wall structure of Uniflex.



Cross-section shows the welded, convoluted-diaphragm construction of Titeflex Bellows.

Let Our Family of Products Help Yours

Titeflex

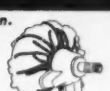
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Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

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Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, Pa.

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Colonial Bushings, Inc., P. O. Box 37, Harper Sta., Detroit, Mich.
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Universal Engrg. Co., Frankenmuth, Mich.

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Homestrand, Inc., Larchmont, N. Y.
Inter-Continental Trading Corp., 90 West St., New York 6, N. Y.
Millers Falls Co., Greenfield, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
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Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

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Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.

CAMS

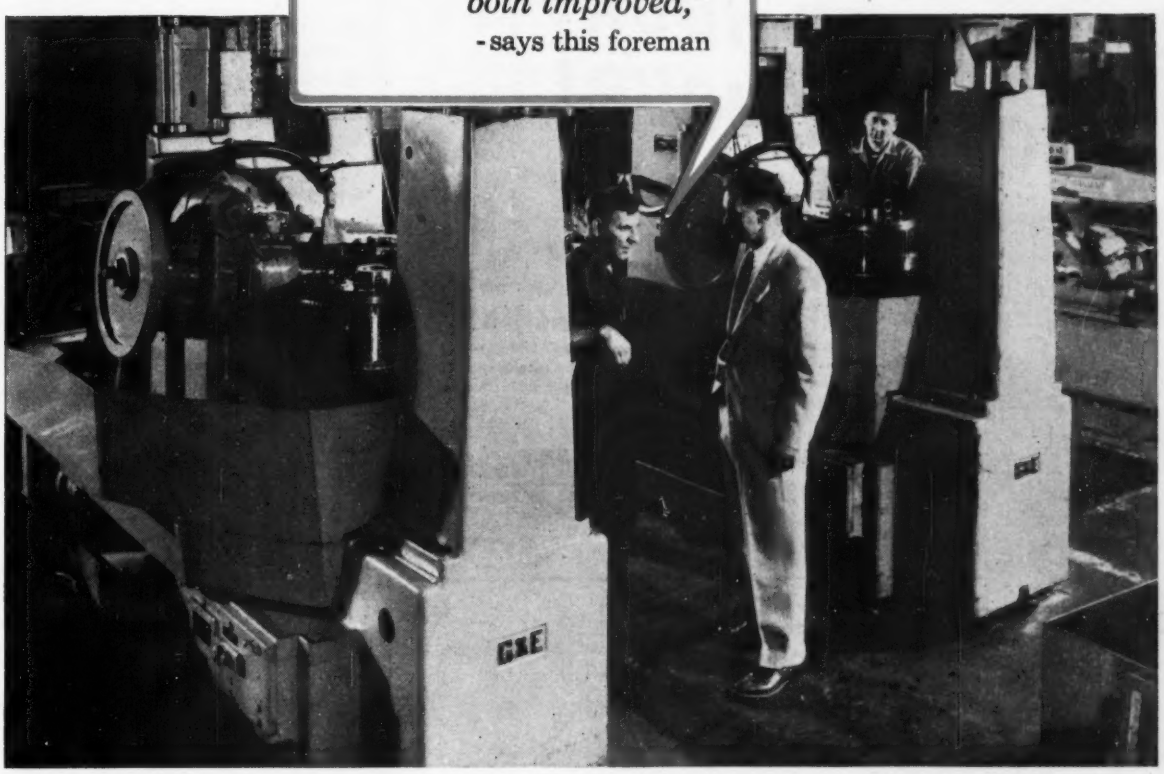
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Rowbottom Machine Co., Sheffield St., Waterville, Waterbury, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

(Continued on page 296)

alloy steel drive gears for M-47 tank

hob better with GULF ELECTRO CUTTING OIL!

"Hob life and tooth finish both improved," - says this foreman



Operation—cutting involute teeth on alloy steel spur gears, Gould and Eberhardt Gear Hobbers; results with Gulf Electro Cutting Oil—Hob life increased 20%, scuff marks eliminated on gear teeth, and hob grinding costs reduced.

Here's the important reason why Gulf Electro Cutting Oil produces outstanding results like these: Thanks to a special Gulf process of combining sulphur, it provides greater sulphur activity over the entire range of a cutting operation. This means longer tool life and better finishes.

Call in a Gulf Sales Engineer today and arrange to use this quality cutting oil on your tough machining operations, or send the coupon below for additional information.

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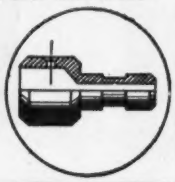
SNOW

FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C'T" Sink 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical Index
Equipment—#1-UD Drilling Machine



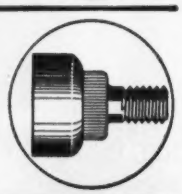
TAPPING

Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine



THREADING

3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

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Adamas Carbide Corp., 999 South 4th St., Harrison N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating.

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., Waterbury 20, Conn.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, Iron

Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

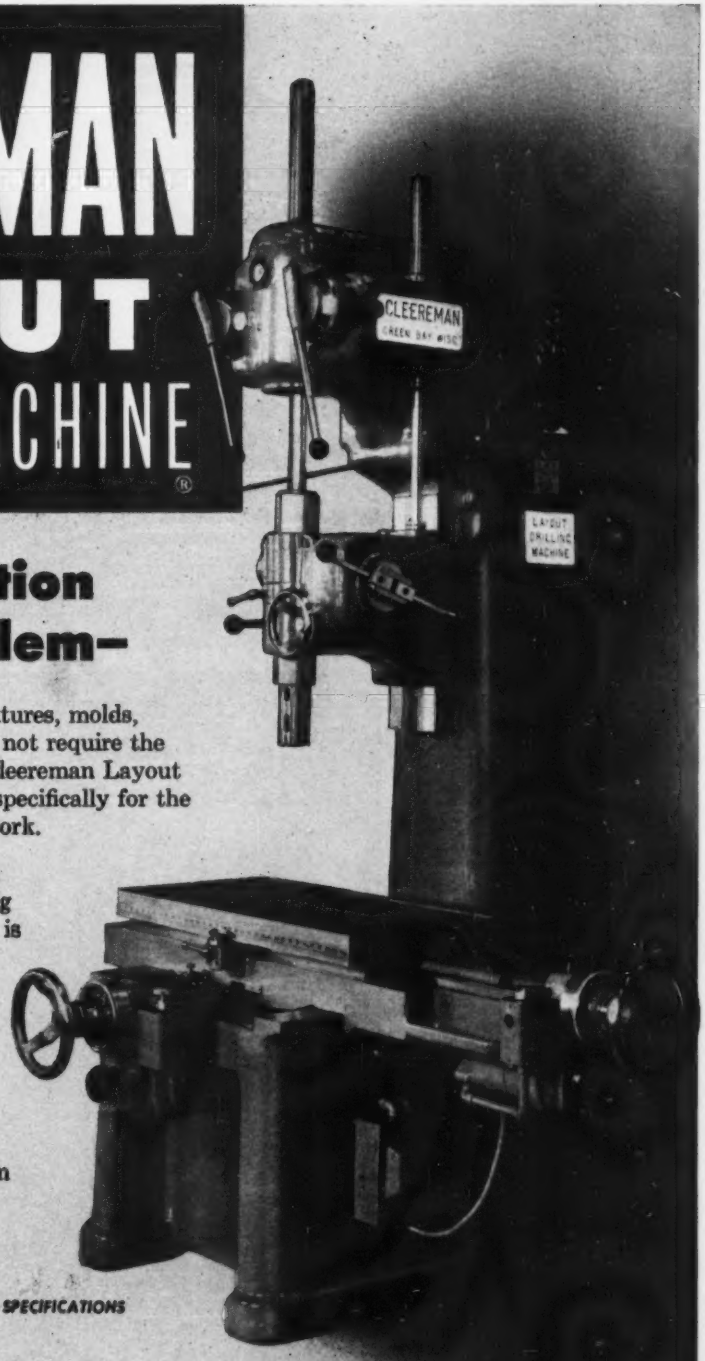
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

CENTERS, Lathe

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Jergens, J. G., Co., 11106 Avon Ave., Cleveland 5, Ohio.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

(Continued on page 300)

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A Modern solution to an Old Problem–

A large portion of tools, dies, jigs, fixtures, molds, jig-less production and other jobs do not require the ultra-precision of a Jig Borer. The Cleereman Layout Drilling Machine has been designed specifically for the efficient handling of this particular work.

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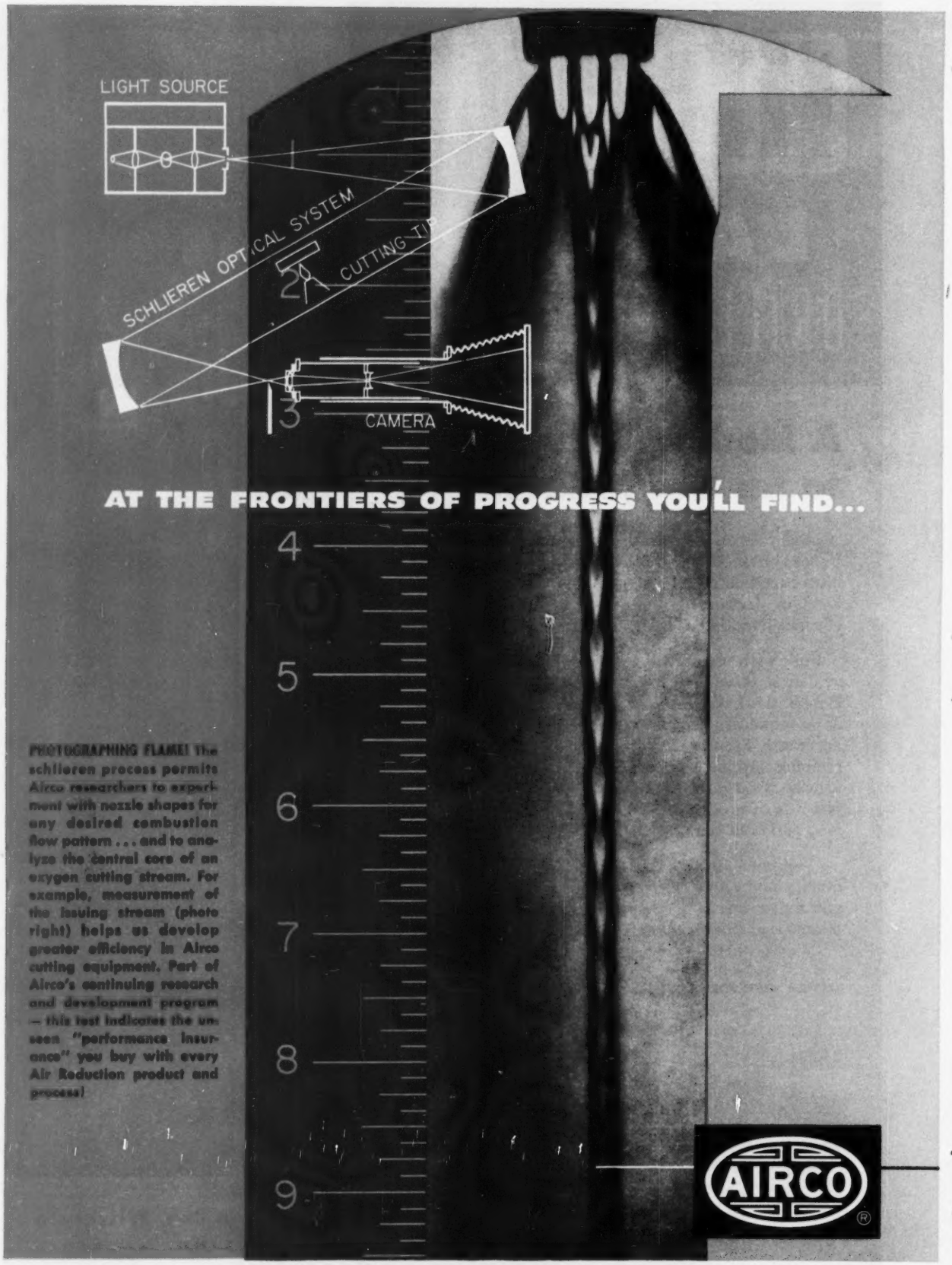
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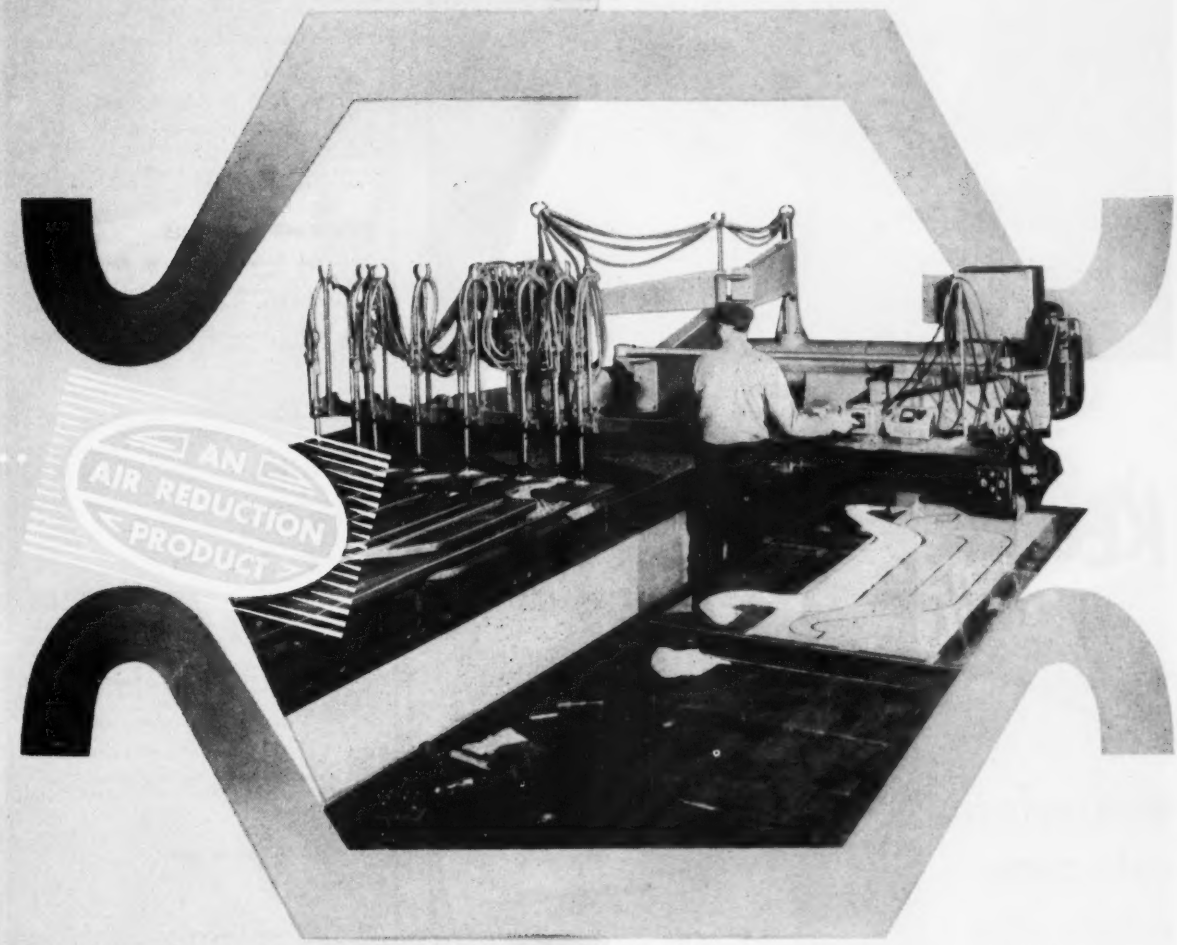
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Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cieco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Logansport Machine Co., Inc., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets.

CHUCKS, Diaphragm

Van Norman Co., 2640 Main St., Springfield 7, Mass.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

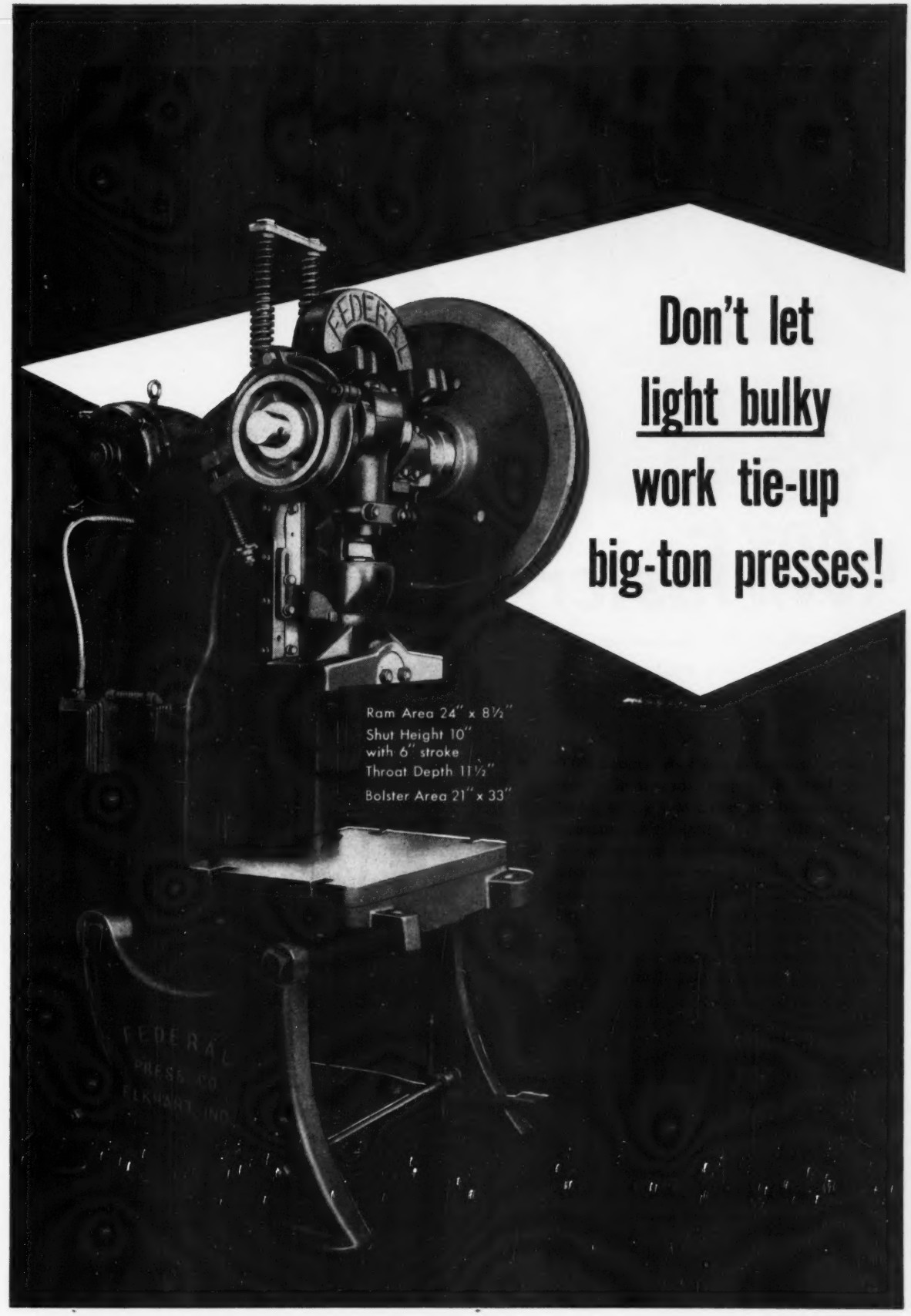
CHUCKS, Drill

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

CHUCKS, Full Floating

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Universal Engineering Co., Frankenmuth 2, Mich.

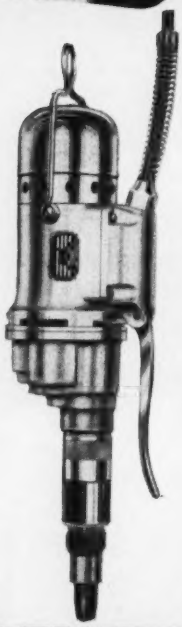
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work tie-up
big-ton presses!
Ram Area 24" x 8½"
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with 6" stroke
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Horton, E., & Son Co., Windsor Locks, Conn.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Homestrand, Inc., Larchmont, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

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Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.

(Continued on page 306)

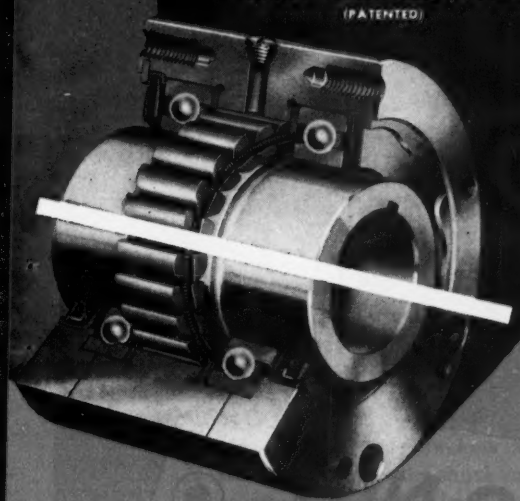
FORMSPRAG

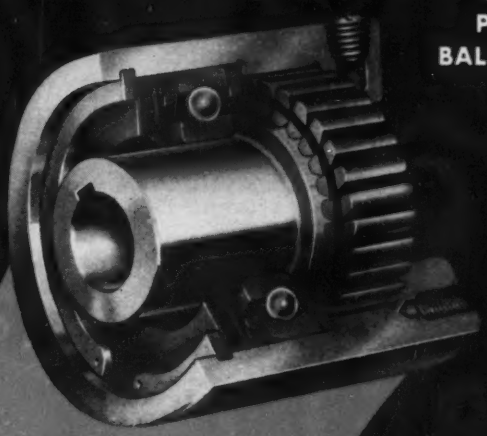
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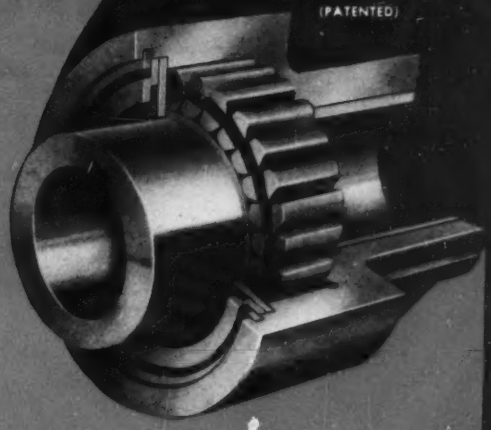
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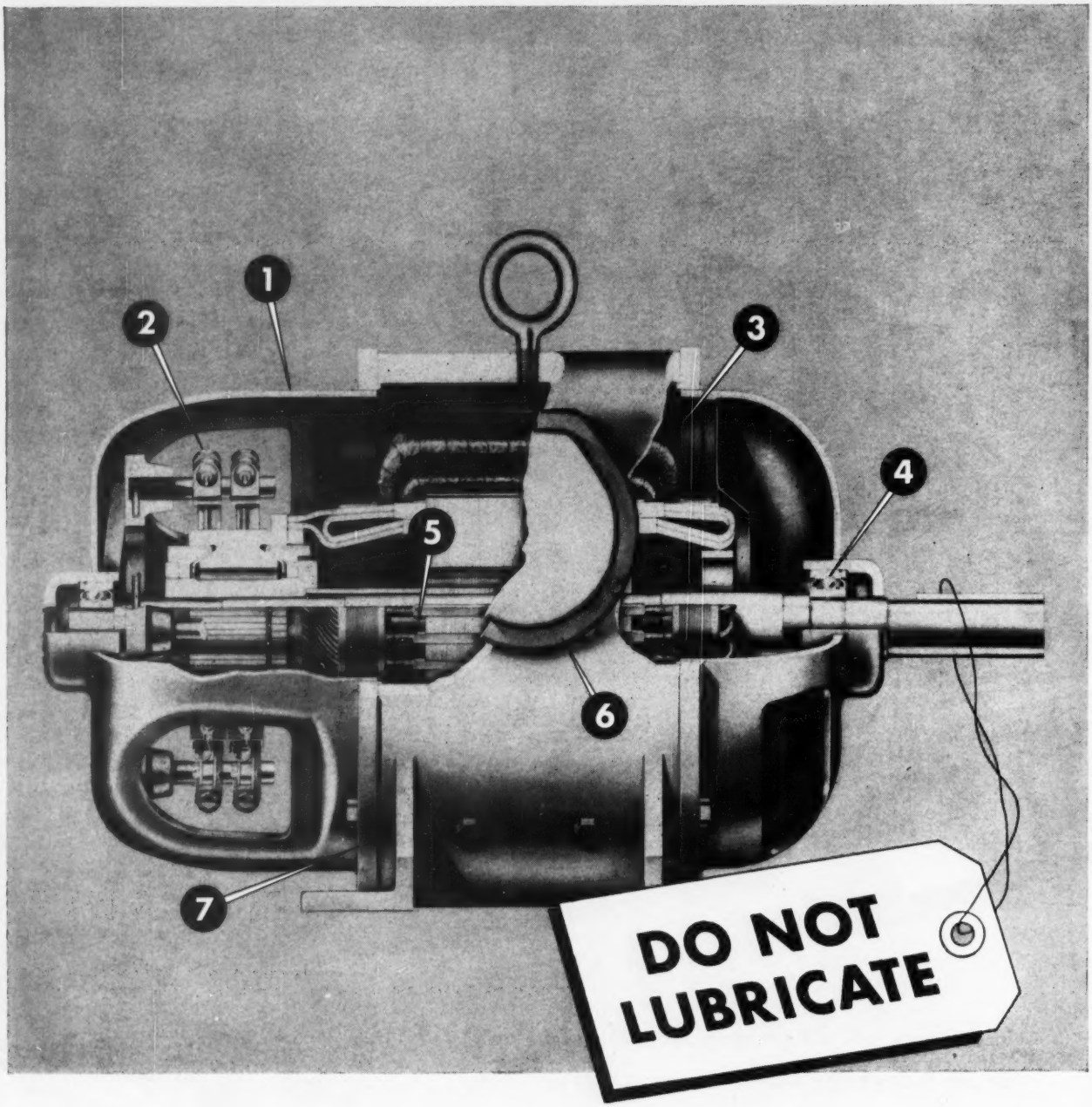
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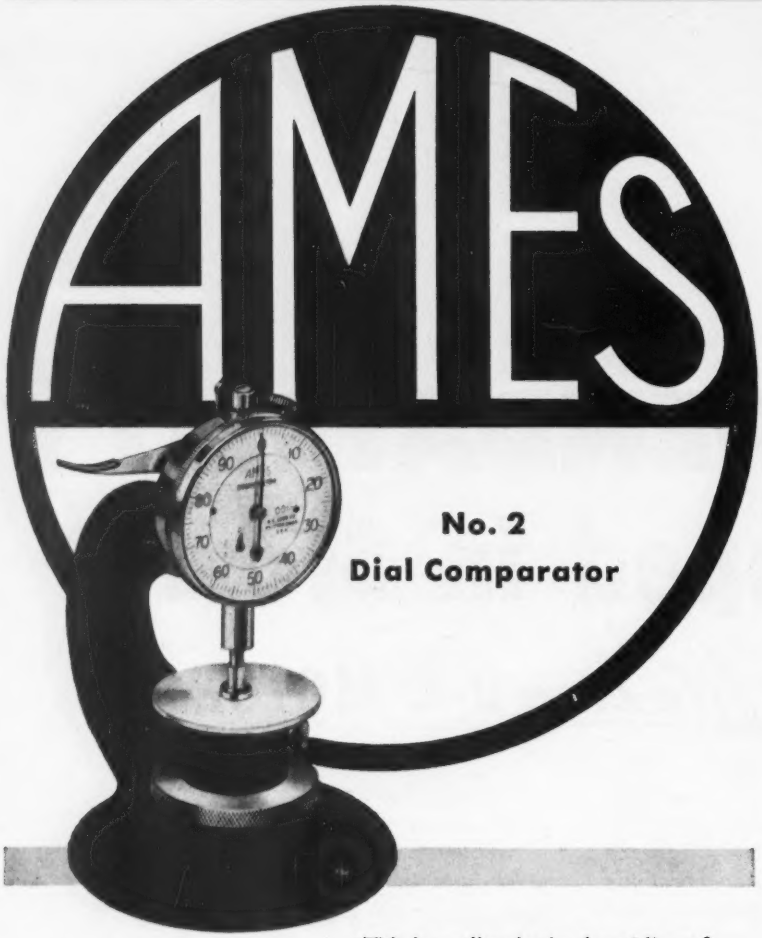
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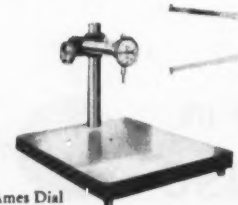
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Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., Ferndale, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Portman Instrument Co., Port Washington, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

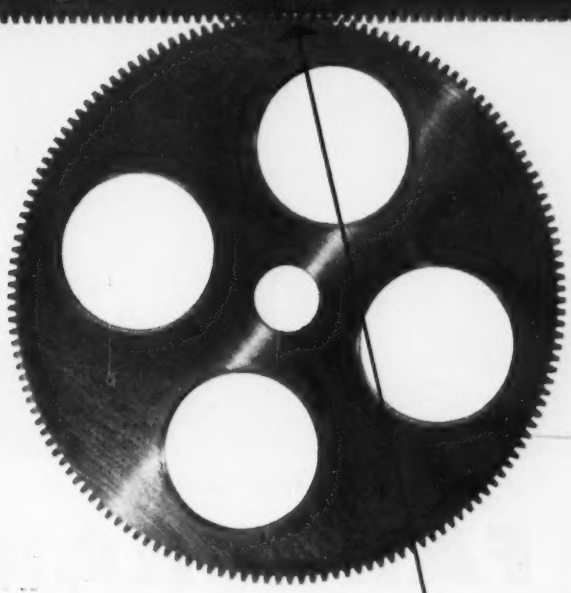
COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping).
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Sinclair Refining Co., 630 5th Ave., New York.
Standard Oil Co. (Indiana) 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

(Continued on page 308)



Why you can *reduce rejection losses* with a Kodak Conju-Gage Gear Checker



Why the composite check

In practice, the final test of gear quality is how the gear works in use. The composite check recommended in American Standard B6.11-1951 shows this conclusively by measuring displacement of the gear when run against a master of known accuracy. And it does it in one quick operation that checks combinations of as many as six types of errors.

Why the Conju-Gage Gear Checker

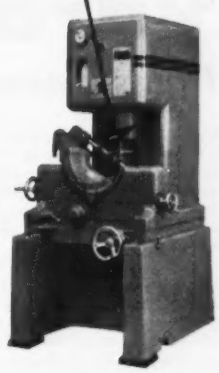
Since displacement represents the sum of both gear error and error in the master, the accuracy of the master used determines the precision of the composite check. The Kodak Conju-Gage Gear Checker uses a master of exceptional accuracy, the Conju-Gage Worm Section. Produced by thread grinding, its accuracy is not limited by the same manufacturing processes which limit accuracy in the gear itself.

To settle for masters of lesser accuracy is to rob yourself of "tenths"—to chance that tolerable error in a gear may coincide with error in the master to cause a needless rejection. Or that intolerable error in a gear may be cancelled by error in the master to pass a gear that will fail in use.

To reject every wrong gear is to guard the quality of your product. To pass every right gear is to reduce such rejection losses to a minimum.

To find out more about how a Kodak Conju-Gage Gear Checker can lower costs while maintaining required precision, send for your copy of the booklet, "Kodak Conju-Gage Gear Testing Principle." Write to

Industrial Optical Division
EASTMAN KODAK COMPANY, Rochester 4, N. Y.



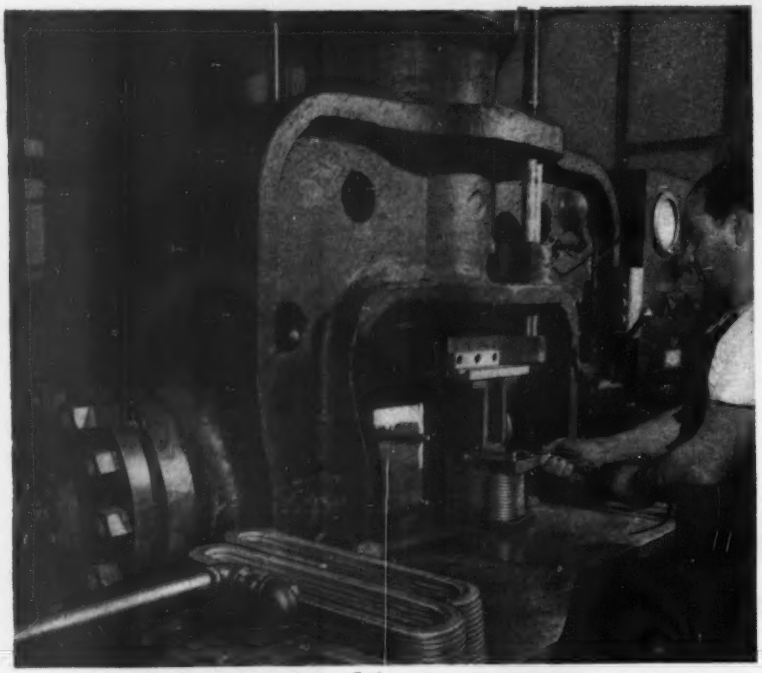
The Kodak Conju-Gage Gear Checker automatically records the composite effects of runout, base pitch error, tooth thickness variations, profile error, lead error, and lateral runout. Illustrated is the Kodak Conju-Gage Gear Checker, Model 8U, for gears up to 8¼" pitch diameter. Smaller models are also available.

CONJU-GAGE  **INSTRUMENTATION**

... a new way to check gear precision in action

To inspect all kinds of complex parts on a bright screen, Kodak also makes two highly versatile contour projectors.

Kodak



How this 2-way

FARQUHAR Hydraulic Press

forms motor and generator coils

In producing motor and generator coils from ¼ x 1-in. copper stock, the stock is first bent and the ends laminated, and then pressed to restore them to their original thickness. Then, the coil is put in this Farquhar 2-way Hydraulic Press for "pressing" the form.

The coil is laid on a steel block, a three-part filler mandrel inserted, and a top block applied. The press "snugs" the coil sides at low pressure (40 tons); then the vertical ram snugs the top. The operator kicks the pressure-shift pedal, to double vertical-ram pressure for forming.

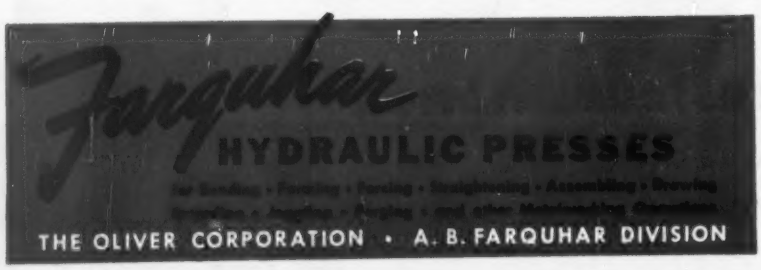
Capacities of rams are 100 tons horizontally and 200 tons vertically. Illustration above shows operator withdrawing the coil after forming has been completed.

Farquhar Presses Cut Your Costs

The above installation is just one more example of Farquhar performance in heavy production! Farquhar Presses are built-for-the-job . . . assure faster production due to rapid advance and return of the ram . . . greater accuracy because of the extra guides on the moving platen . . . easy, smooth operation with finger-tip controls . . . longer life due to positive control of speed and pressure on the die . . . long, dependable service with minimum maintenance cost!

Farquhar engineers are ready to help solve whatever production problem you may have. Their expert assistance is yours for the asking. Give them a call . . . at no obligation, of course!

Or, send for our free catalog showing Farquhar Hydraulic Presses in all sizes and capacities for all types of industry. Write to: THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1504 Duke St., York, Pa.



COMPOUNDS, Resin and Molding

Bakelite Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CONVEYORS FOR DUST, CHIPS, ETC.

Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

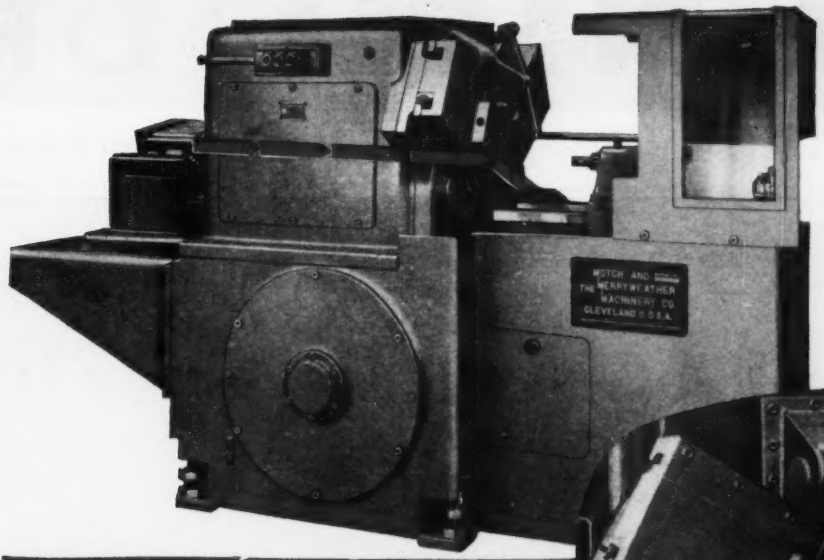
COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co, Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

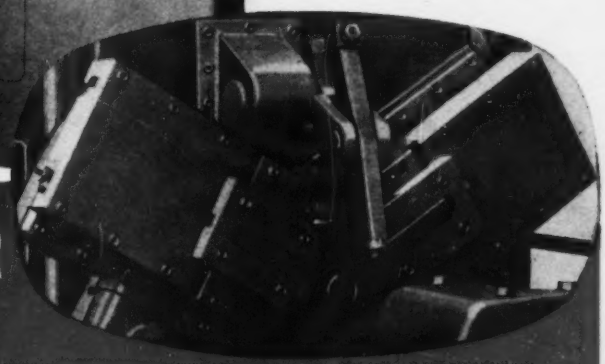
Standard Pressed Steel Co., Jenkintown, Pa.

(Continued on page 312)



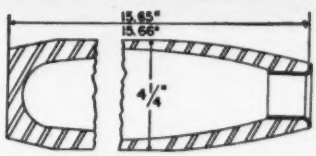
MP/SF
Most Production per Square Foot

Conveyor carries shells to hopper. Shells are fed automatically through hollow spindle, machined and ejected onto conveyor.

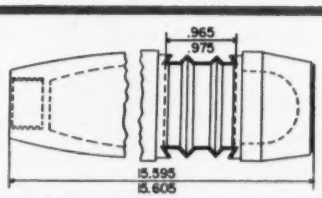


MOTCH & MERRYWEATHER *Automatics* make the most of AUTOMATION

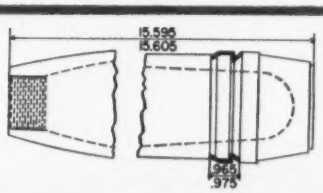
Material: shell steel SAE 1050.
Operation: bore, face, chamfer (nose end)
Estimated Production: 220 pcs/hr. @ 100%.



Material: shell steel SAE 1050.
Operation: face base, turn band groove and band relief.
Estimated Production: 120 pcs/hr. @ 100%.



Material: shell rotating band.
Operation: turn band.
Estimated Production: 220 pcs/hr. @ 100%.



This single-spindle, form-turning automatic, developed for civilian production, has been assigned to much heavy duty munition work. Loading, positioning and unloading are completely automatic. All functions are actuated by hardened cams. With operator fatigue eliminated, one man can service several machines.

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

MACHINE OF



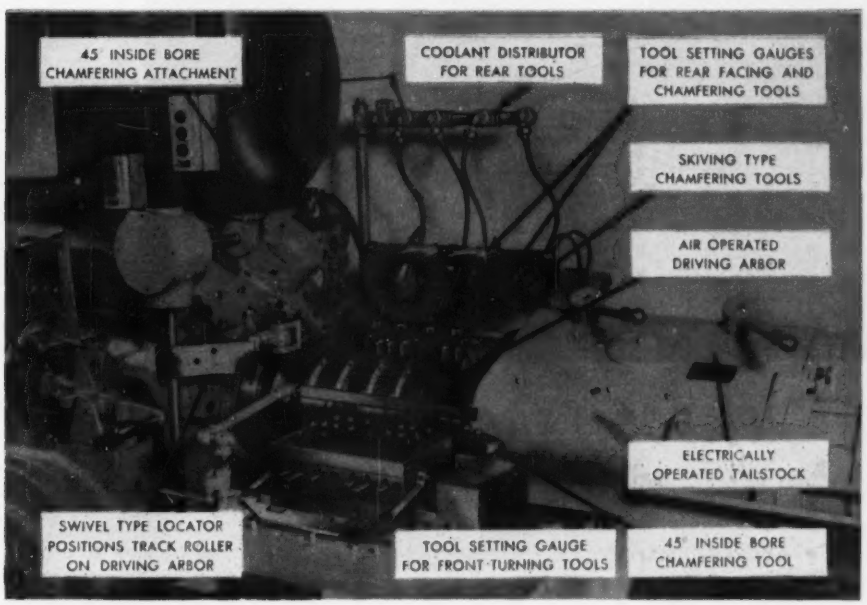
PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

MODEL R-14 *Lo-swing* LATHE CUTS MACHINING TIME ON TRACK ROLLERS

Overall view of machine showing rough and finished work.



Close-up view of tooling.

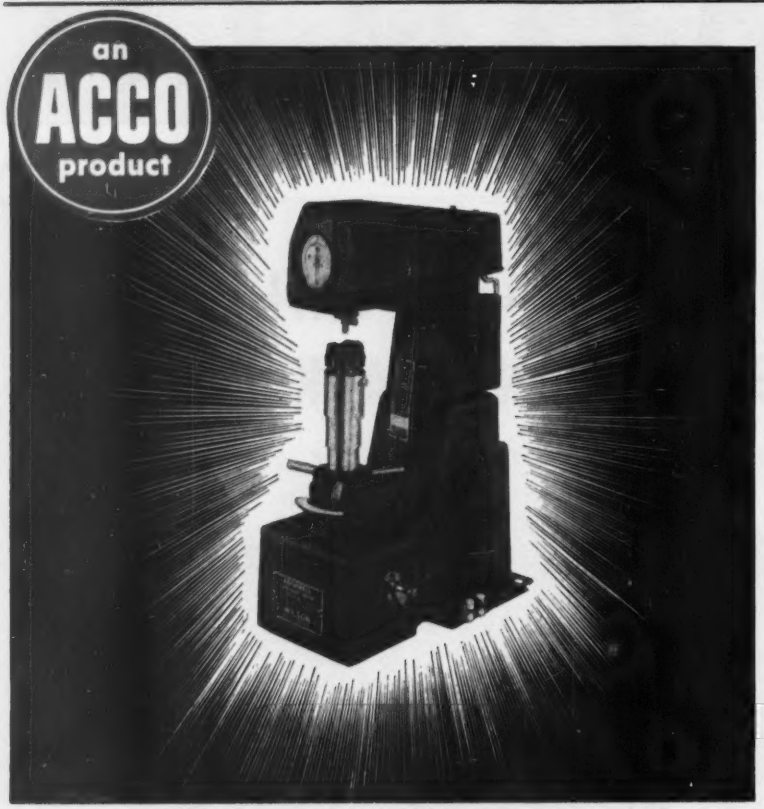
Problem: **To automatically turn, face and chamfer Track Rollers in one operation.**

Solution: **The Model R-14 Automatic Lo-swing Lathe was selected for this job due to its rigid construction and its demonstrated fine performance with cemented carbide tools. The Track Rollers, 9-3/4″ in diameter and 9-3/8″ long, are held and driven from the rough forged bore with a compensating type, six jaw air operated driver. The tailstock, shown in the withdrawn position in the large illustration, is electrically operated and has a travel of 16″ to facilitate loading and unloading of the rollers on the driver. The above illustration shows the tooling which consists of six front turning tools, eight heavy rear facing tools, eight small chamfering tools and two chamfering tools for the inside diameter. Note the special cam operated, 45° inside bore chamfering attachment mounted on the headstock of the lathe. Swivel type tool-setting gauges, mounted directly on the tool blocks, reduce tool-setting time. All tools are cemented tungsten carbide operating at cutting speed of 350 ft. per minute. Total floor to floor time for the job is 3.5 minutes each.**

Engineered jobs are our specialty, and our staff is at your disposal to assist in solving your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH *Lo-swing*



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WILSON "ROCKWELL" and TUKON Hardness Testers

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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Peck, Stow & Wilcox Co., Southington, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Sier Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Sier Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES, Hand Traveling

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

(Continued on page 314)



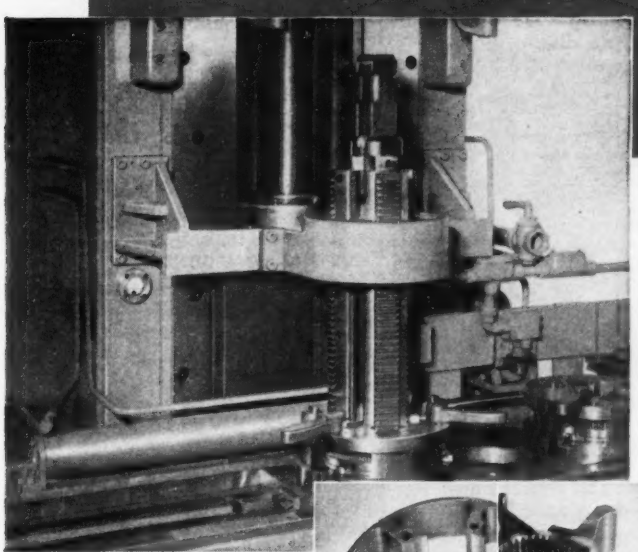
The New Trend...

the COLONIAL method

At Colonial, experience, imagination and competence are applied

1 to the design and manufacture of each of the individual components of a complete broaching installation, and

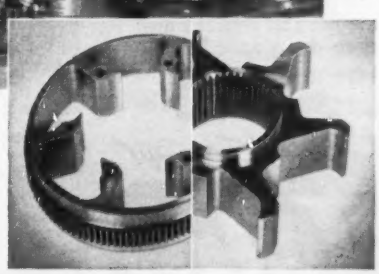
2 to the effective combining of ALL components into a completely UNIFIED BROACHING installation—making them work as a "team."



3 Colonials Broach Intricate Aero Parts

Three Colonial broaching machines rough and finish broach these two mating aircraft engine parts. Six internal contours on the body are broached on a 15-ton Model RD pull-down (illustrated). The spider's external contours are broached on a Model RS 6-ton single ram and internal involute splines on a 15-ton Model RD pull-down machine.

Machines, broaches, fixtures, etc., were all designed by Colonial as a UNIFIED BROACHING INSTALLATION.



WHAT'S AHEAD IN BROACHING?

Keep up with the latest developments: Read "Broaching News". We will be glad to see you get it regularly if you will drop us a line on your company letterhead.

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

Engineers!

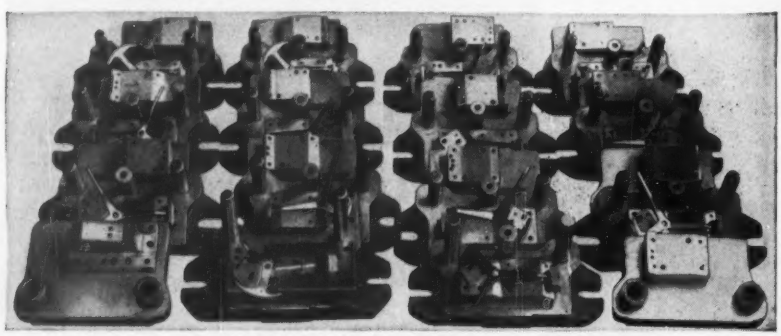


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Two . . . three . . . fifty component dies can be built by B. Jahn — each production proved to guarantee one perfectly fitting, operational assembly.

Modern production requires assemblies — each component demanding a separate tool and die — each having a vital relationship — all needed when you want them. In the modern B. Jahn plant, 165 skilled tool-makers representing 3654 years of experience *work together* developing multiple dies of flawless precision for intricate assemblies.



Part of a set of twenty-eight B. Jahn built precision forming dies, to produce different component levers for one of America's largest calculating machine manufacturers. B. Jahn builds multiple dies as a team — each engineered to do a specific job perfectly.

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Send TODAY for "The Story of B. Jahn Production Proved Dies" — a fact-packed brochure illustrating B. Jahn's facilities and their production-increasing, money saving applications.

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Douglas Tool Co., 2300 E. Nine Mile Rd., Hazel Park, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Haynes Stellite Div, Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
OK Tool Co., Milford, N. H.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files and Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

(Continued on page 316)

Need OOO shapes and sizes of carbide?



We press or preform to your designs in CARMET

to save you expensive grinding!

GET THE NEW CARMET CATALOG

Just out . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order. • *Write for your copy.*

ADDRESS DEPT. M-39

When the exact shape and size of Tip you need is not to be found in carbide producers' catalogs, what should you do?—(1) order the Tips that seem to be adaptable, and then go to the expense of grinding them down to suit—or (2) ask CARMET to build you a die that presses the Tips to *your* designs? The answer is obvious! Save costly grinding.

Each one of the designs pictured above was pressed or preformed by us in quantity to the specific requirements of some individual customer. No excess metal remained for costly removal.

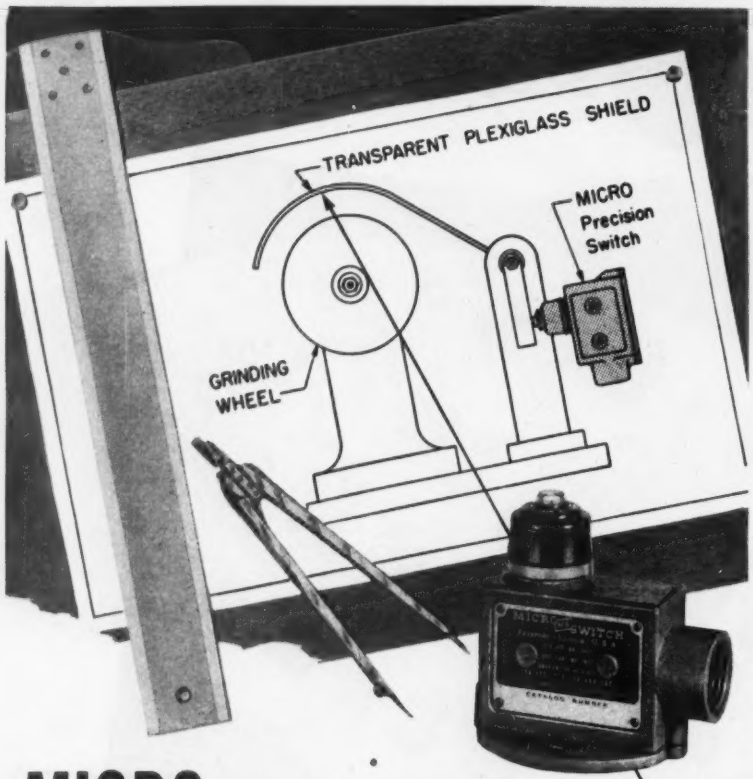
For suggestions, call or write your nearest A-L representative today. • *Allegheny Ludlum Steel Corporation, Carmet Div., Wanda & Jarvis Aves., Detroit 20, Mich.*

For complete MODERN Tooling, call

Allegheny Ludlum

WAD 3988

AL FINE TOOL STEELS SINCE 1854



MICRO switch says "no grinding" unless protecting shield is over the wheel

HERE'S a safety use of a MICRO precision switch for almost any plant, protecting eyes and face of grinding wheel operators from flying particles.

Plexiglass shield is linked to the plunger actuator of the MICRO switch which only closes the power circuit when the shield is in the "down" position.

This application of a MICRO switch to a universal plant problem is just one of hundreds of uses that plant engineers, electricians and operating men are finding for these versatile switches.

As limits, safeties and interlocks, they make existing equipment safer, more efficient and more productive. They are available for bottom and side mounting and with actuators to take any kind of actuating motion.

Ask for them at your local authorized MICRO distributor. You will find him under "switches, electric" in your classified telephone book. MICRO field engineers are located in principal cities, too, to assist in the solution of complex switch problems. Call your nearest MICRO branch office.

MICRO MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS
A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.

CYLINDERS, Air

Bellows Co., 230 W. Market St., Akron, Ohio.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, Ill.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Logansport Machine Co., Inc., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.

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(Continued on page 318)

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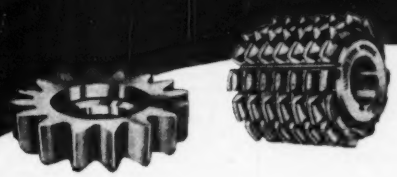
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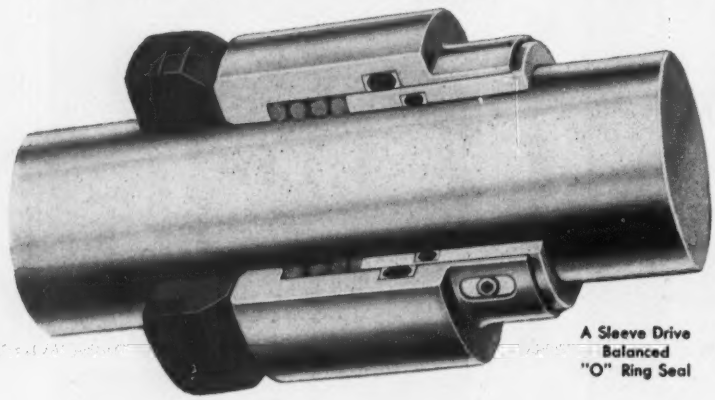
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Walker, O. S., Inc., Worcester, Mass.

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Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

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Smit, J. K., & Sons, Inc., Murray Hill, N. J.

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See Castings, Die.

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Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
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Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

DIE SETS, Standard

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Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.

(Continued on page 320)



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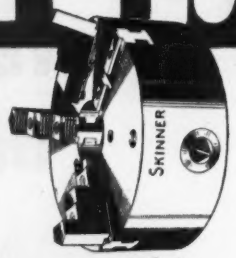
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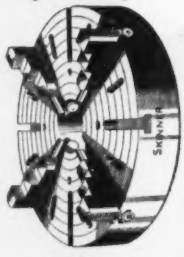
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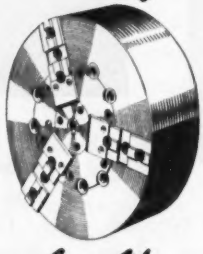
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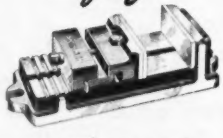
quality



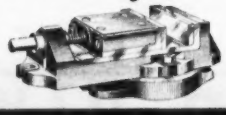
accuracy



long life



positive grip



SCROLL CHUCKS Self-centering models for light, medium and heavy duty jobs in tool room or for production runs. Available in sizes from 3" to 18" with semi-steel or forged steel bodies, and heat-treated alloy steel for all other parts. Provided with two sets of solid jaws or two-piece jaws for holding internal or external work. Lands on the jaw, jaw steps and end bites are ground after the chuck is assembled.

INDEPENDENT CHUCKS Models for medium and heavy duty tool room and general machine shop work. Available in sizes from 4½" to 36" with semi-steel, steel, or forged steel bodies. All other parts are heat-treated alloy steel. Jaws are solid reversible or two-piece with reversible tops for either internal or external gripping. The body surrounds more than 60% of each operating screw for the full length of the screw to assure proper alignment at all times.

AIR & POWER CHUCKS Self-centering models for heavy duty production work on engine and turret lathes and automatics. Sizes from 6" to 24" with forged steel bodies, and with either 2 or 3 jaws are available. The wedge angle is such that work is gripped positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar. Skinner also has a complete line of power chucking accessories.

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Details on the full line of products are included in Skinner General Catalog — write to the company or your nearest Skinner distributor for a free copy!

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206 Edgewood Ave., New Britain, Conn.

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Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

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Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
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DIES, Lettering and Embossing

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Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
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Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham, Mass.

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Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

(Continued on page 322)

BAY STATE MOUNTED POINTS and WHEELS



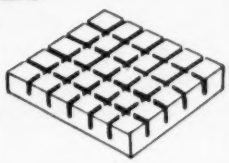
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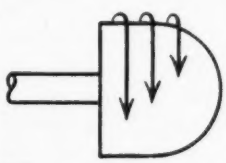
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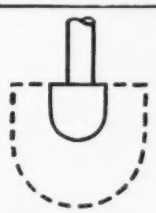


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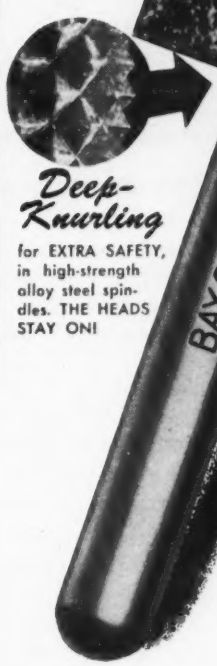
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Result: Abrasive heads stay on spindles.

3. Each wheel trued and shaped after mounting on its spindle.
Result: Perfectly concentric; ready to use when you get it.

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on the spindle for perfect contour and complete concentricity.

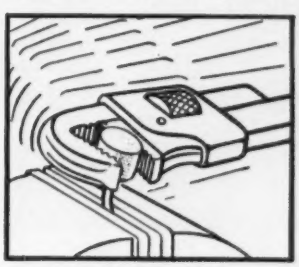


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USE THEM . . . right down to the spindle!



Wrench-and-vise test proves its strength. This cement HOLDS, under EXTREME STRAIN.

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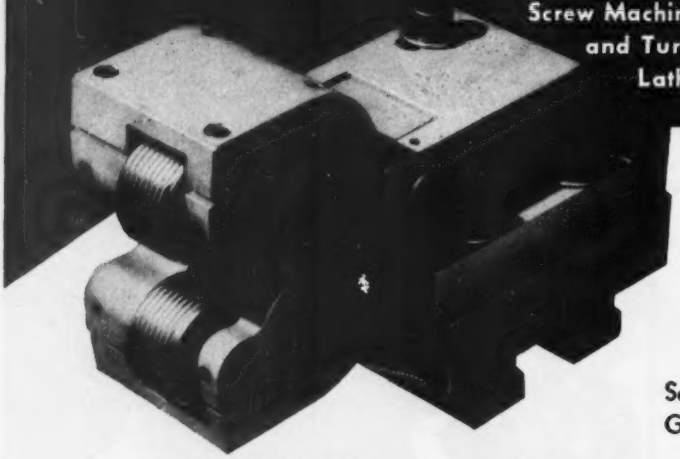
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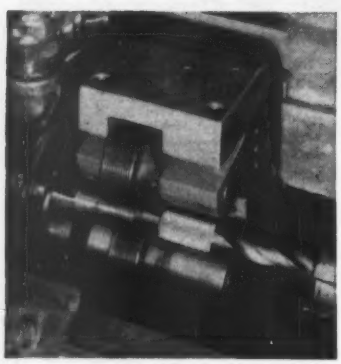
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*** Full Diameter Range to Capacity**

*** Simple Precision Matching . . .**



Reed attachments have two opposed rolls which pass over the work when rolling the thread. They are easy to set up and rolls may be quickly changed and adjusted for size. A simple device provides for precise matching of the rolls.

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Send us specifications of your requirements and let us supply you with complete information.

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U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio
Meyers, W. F., Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Norton Co., 1 New Bond St., Worcester, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

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Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

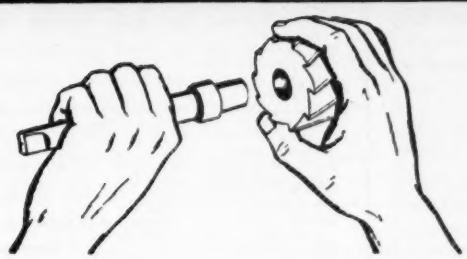
DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bellows Co., 230 W. Market St., Akron, Ohio.

(Continued on page 324)

Cut replacement costs in HALF with NEW T-J REAMERS





- **Quick Change of Heads . . . *Saves Time!***
- ***Easy* to change heads for *different metals* . . . increases efficiency!**
- **Wide range of sizes . . . spiral flute!**

These new-type T-J Reamers have *interchangeable heads!* Just *one shank* to buy—use it with wide range of heads from ½" to 2¾" inclusive, in 1/16" increments... spiral flute. This cuts replacement cost to *less than half!*

Head has tapered hole which insures concentricity and a snug fit on smoothly ground tapered shank. Reamer operates free from binding or sticking, due to cutting portion wearing undersize and creating negative relief. Performance retains all advantages of standard, expensive reamer. Backed by T-J's 37 years of know-how as one of largest manufacturers of die sinking milling cutters. Write for more details. The Tomkins-Johnson Co., Jackson, Michigan.

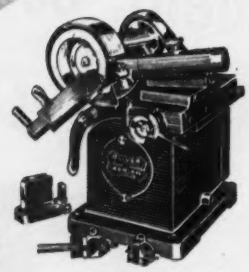
37 YEARS EXPERIENCE (T-J)

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At The First Sign of Dullness Sharpen Your Drills With

OLIVER DRILL POINTERS





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Your Drills Will

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- last longer
- produce more accurate holes

It is important to remove twist drills from the drilling machine and replace them at the first sign of dullness. Better yet, allow them a certain number of hours production or a certain number of parts produced — then *play safe* • protect your production run • sharpen them *correctly* on an Oliver Drill Pointer. Oliver Drill Pointers give balanced cut, with each lip doing equal work, eliminating the excessive drill costs and imperfect holes usually traced to improper drill grinding.

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances. Variable point angles. Full automatic operation.

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Write for our free Booklet "How To Produce More Holes With Your Drills!"

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Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive Menlo Park, Calif.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRILLING MACHINES, Automatic

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hartford Special Mchry Co., 287 Homestead St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Wales-Strippit Corp., North Tonawanda, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Dumore Co., 1300 17th St., Racine, Wis.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

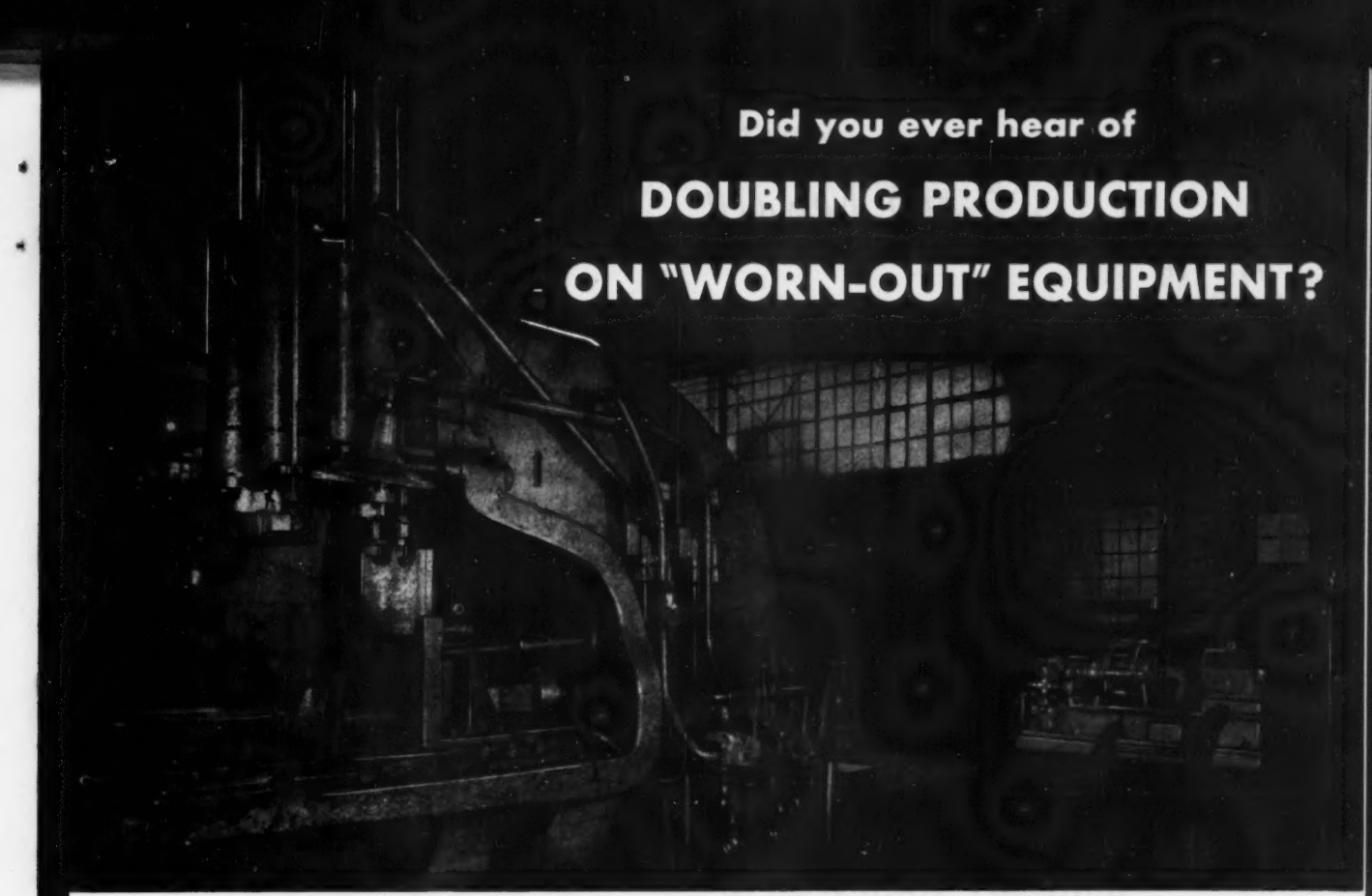
DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.

DRILLING MACHINES, Deep Hole

Bellows Co., 230 W. Market St., Akron, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester Mass.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hdrtford 1, Conn.
Wales-Strippit Corp., North Tonawanda, N. Y.

(Continued on page 326)



Did you ever hear of

DOUBLING PRODUCTION ON "WORN-OUT" EQUIPMENT?

You may gain a valuable hint from this story how Treadwell renovated an old belling machine with Oilgear Fluid Power

The belling machine used for flanging big boiler ends in the Treadwell Corporation plant at Midland, Pa., has seen many years of service. The machine was slow, was "down" a lot, maintenance was high and production was off.

A careful analysis indicated that the press itself was not at fault; the trouble was associated entirely with the water pump, storage and accumulator system used to power the press gripping and main rams.

Two alternatives confronted the Treadwell people. One was to repair or replace the water system. This ran into a figure prohibitively high. It would not solve the problem of high maintenance, faulty control, erratic performance, the shocks inherent in the system, the slow cycles.

The Treadwell people chose the second alternative and called in an Oilgear Fluid Power engineering representative. This is what happened:

A standard Oilgear Fluid Power system was installed, without modification to the press. The only change was some rearrangement of the piping system. The cost was from one-fourth to one-third that of repair to or replacement of the water power system.

The operation of the rams was speeded up, the total time for each cycle cut from 66 seconds to 34 seconds. Therefore actual press production was almost doubled. Because the power medium used is oil, friction and wear become almost non-existent. The space required is slightly less than that required by the water pump, but the bulky water tank and accumulator were eliminated altogether.

The interesting thing about this Oilgear Fluid Power, which is smooth, shockfree and dependable is that from the one source, power travels to actuate the gripping rams, then while holding them at gripping pressure, travels over to the main or shaping ram and actuates it; then the same power retracts the rams in order and goes into "neutral" during the next handling step.

The above is only one of a number of similar press "renovations" being performed with the use of Oilgear Fluid Power.

Think of Oilgear Fluid Power as similar in every respect to electric power. It is generated, piped, and applied in the same way, with these **important** exceptions: Oilgear Fluid Power can be used in linear movement where electricity cannot. Oilgear Fluid Power speed can be varied steplessly, smoothly, infinitely where electricity cannot — or only with costly, troublesome, **extra** equipment. Oilgear Fluid Power can be "bled" off, dissipated harmlessly in case of shock. Oilgear is massive, tremendous, resistless power that can be controlled with micrometer precision.

It is probably the most amazingly versatile power there is. Consider Oilgear Fluid Power to improve the saleability of new machines, to renovate old machines, to solve a hundred troublesome problems where other power has failed to help. It costs you nothing to find out. THE OILGEAR CO., 1569 W. Pierce St., Milwaukee 4, Wis.

OILGEAR

OILGEAR



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These are high quality production tools . . . accurately specified, rigidly tested . . . backed by an established reputation for consistently superior performance . . . and supplemented by a field engineering service to meet your needs for specialized wheels.

It will pay *you* to find out about Simonds Abrasive Company products . . . and the man who can supply them. Write for name of your distributor. Also ask for free data book.



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Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div, Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K. Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

DRILLING MACHINES, Horizontal Duplex

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Center Column Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

(Continued on page 328)



Unretouched Photograph by Morton Berger

TAPS *by* CARD

No question if it's Card. **When you reach for a Card Tap you can be sure you have chosen the best. For built into every Card Tap are years of experience in tap making.** ***Ask your distributor.***

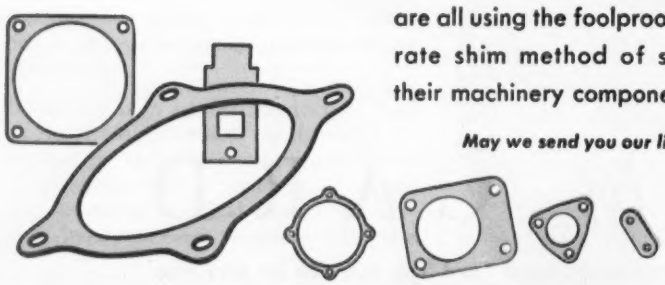
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Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang.

DRILLING MACHINES, Sensitive

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippit Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Upright

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.

(Continued on page 330)

RUGGED, LOW COST AIR CYLINDER WITH BUILT-IN VALVE SETS NEW STANDARDS FOR FAST, PRECISION OPERATIONS



Built-in electrical operating controls, built-in 4-way valve, built-in dual piston rod speed regulators, all with a single air connection, simplify installation of economical pneumatic circuits.

Any repetitive push, pull or lift movement now done manually can be performed infinitely faster, safer, and at lower cost with this unique, electrically-controlled Bellows Air Motor. The range of work it can do is limited only by the imagination of the tool designer or production engineer.

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The Bellows Air Motor is made in a wide range of mounting styles; in five bore sizes to meet varying power requirements; and in standard stroke lengths up to 48″. For mechanical or manual operation the Air Motor can be equipped with a built-in manual valve, or for operation in explosive-hazardous areas with the built-in explosion-proof electrically controlled valve.

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2: Another new product—the **Perkins "Bendit 15"**—a patented metal forming machine which bends and shapes sheets, rods; strips tubing into innumerable complex as well as simple forms that would be difficult or even impossible to make by other means. Eliminates need for expensive tools or specialized skills. Height 47", net weight 200 lbs. Write us today for descriptive catalog, prices, etc.

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PERKINS MACHINE & GEAR COMPANY
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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippit Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Wall Radial

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS, Center

Cleveland Twist Drill Co, 1242 E. 49th St., Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRILLS, Core

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.

DRILLS, Portable Electric

Black & Decker Mfg Co., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

DRILLS, Portable Pneumatic

Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

(Continued on page 332)



NOTE: ***This is the only grinder in its capacity range (longitudinal 24", transverse 8", vertical 12") with a vertical spindle grinding head.***

ABRASIVE No. M-34 VERTICAL SPINDLE SURFACE GRINDER

Only one in it's class!

When the job calls for fast, low cost grinding of flat surfaces, it pays to schedule the work to the Abrasive No. M-34. This toolroom-sized surface grinder puts toolroom grinding on a production basis. Its 6" segmental-type grinding wheel, driven by the full power of a 5 HP built-in motor, permits fast removal of stock — produces ultra-fine surface finishes — maintains flatness and parallelism within very close tolerances.

It will pay you to get full details on the Abrasive No. M-34. Send for complete catalog today. Abrasive Machine Tool Co., 12 Dunellen Road, East Providence 14, Rhode Island.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

HEAVIER CUTS IN HARDER MATERIALS AT HIGHER SPEEDS

Get More Production with GORHAM "M-40-B" Tool Bits!

Get more out of your machine tools . . . raise your production curve . . . with Gorham "M-40-B" turning tools! Use "M-40-B" wherever the application of a Super High Speed Steel is indicated, as in machining heat treated alloy steels with large amounts of stock removal at high surface speeds.

"M-40-B" is a Super Moly grade with performance characteristics comparable to those of super tungsten high speed steel. It has extremely high red hardness, high Rockwell hardness, and offers maximum toughness and abrasion resistance. You can take heavy roughing cuts with it at high surface speeds and feeds . . . use it for high speed finish cuts as well.

"M-40-B" comes in square tool bits, 11 stock sizes, and in 23 stock sizes of rectangular turning tools. Bits and turning tools are accurately ground, uniformly hardened, ready to sharpen. Special sizes and shapes to your order. Illustrated with prices are three popular size "M-40-B" tool bits. See your distributor, or send direct for a trial order.

"M-40-B" is one of three cutting tool materials developed by Gorham. Others are Gorham "Standard", for the commercial field, and "Gormet", for turning soft or abrasive stock. They're completely described, with size and price lists, in a new free bulletin. Send for your copy today.



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Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.

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Besly-Welles Corp., Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mich.
Pratt & Whitney, West Hartford 1, Conn.
National Twist Drill & Tool Co., Rochester,
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

DRIVES, Chain

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois, Detroit, Mich.

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Pangborn Corp., Hagerstown, Md.

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EMERY WHEELS

See Grinding Wheels.

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Precise Products Corp., 1328-30 Clark St., Racine, Wis.

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(Continued on page 334)

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High speed steel shockproof segments curl the chips out of the cut for cooler, smoother, faster cutting, and longer sawing life.



Available from stock in 12″ to 55″ diameter. Up to 96″ diameter supplied on order.

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ATKINS

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All mechanical units of the Reid Grinder are built around a rugged one-piece column casting mounted *on* a one-piece base, making the column an integral part of the grinder. This exclusive Reid feature insures permanent alignment of cross slide saddleways and vertical headways.

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Capacity: 6" x 18" x 15¼"
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General Electric Co., Schenectady 5, N. Y.

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Federal Press Co., 600 Division and Big Four R. R., Elkart, Ind.
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U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

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American Felt Co., Glenville, Conn.

FILES, Hack

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jarvis, Chas. L., Co., Middletown, Conn.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

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Grob Bros., Grafton, Wis.
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Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Jarvis, Chas. L., Co., Middletown, Conn.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

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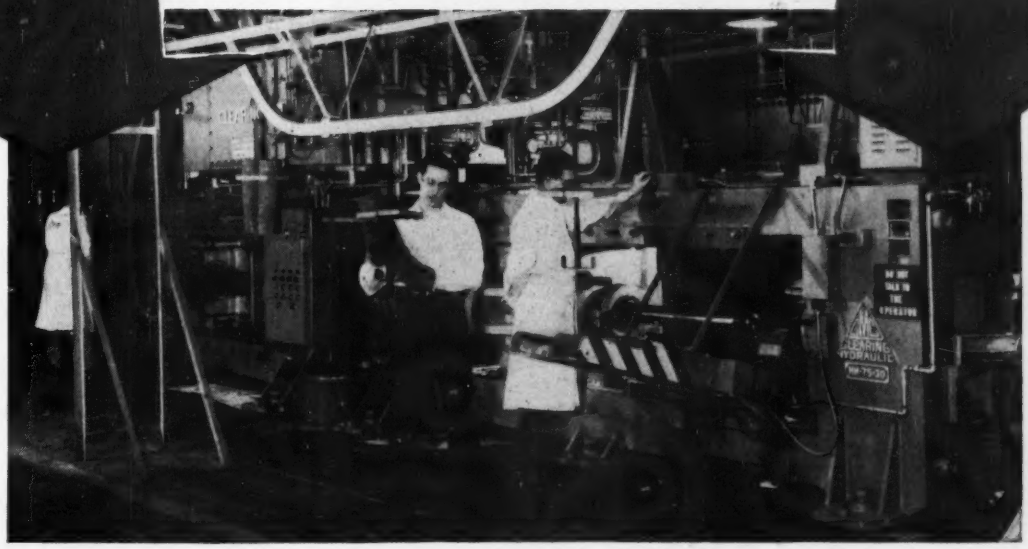
See Couplings, Flexible.

FLEXIBLE SHAFT EQUIPMENT

Dumore Co., 1300 17th St., Racine, Wis.
Jarvis, Chas. L., Co., Middletown, Conn.

(Continued on page 336)

1 press does the work of 2



CLEARING Helps Rheem Boost Production

When Rheem Mfg. Co. took on the job of producing cartridge cases, they tooled up their New Orleans plant with a new type of Clearing hydraulic press—a press that revolutionizes cartridge case production.

The new Clearing double end press produces at both ends of the stroke—does the work of two conventional presses. While one slide has completed a draw and is on its return stroke, the other slide is performing a drawing operation on the opposite end of the press.

Clearing horizontal double end presses represent savings not only in capital investment, but they require less manufacturing space and less maintenance than two conventional presses. Double end presses also reduce original installation cost, productive labor cost, and power consumption—since only one hydraulic drive unit is used.

The double end press was Clearing's answer to the problem of cartridge case manufacture. Supplying the right answers to manufacturers who make all types and sizes of products has been a strong point with Clearing engineers for years. If you have a problem involving power presses, you'll find the best answer at Clearing.



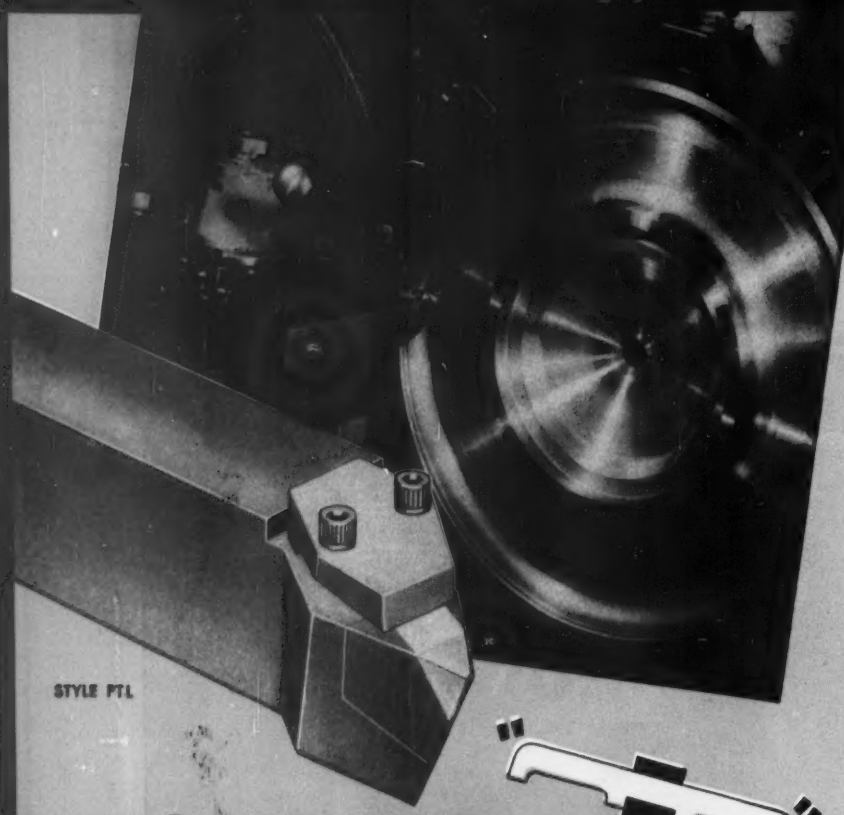
Color Movie: "A Better Way to Manufacture Shell Cases" See new Clearing double end presses in action. This movie is available for showings in manufacturing plants or to technical groups. Write Advertising Dept., Clearing Machine Corporation.

CLEARING MACHINE CORPORATION

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HAMILTON DIVISION—HAMILTON, OHIO

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION



HERE'S THE TOOL *that fits to a*



The right angle chucking lathe, tracer controlled, provides for efficient profile machining of workpieces having large diameter, short length, and thin wall sections, particularly those made of stainless steel and heat-resistant alloys.

To complete the set-up, an appropriate cutting tool is required. It must be shaped to accurately follow the lead of automatic control, face up to the job, and cut corners with maintained precision.

For this very purpose a Kennametal tool has been designed. The mechanically-held triangular insert, seated in a hardened V trough, provides a sturdy design in a 50° nose angle tool that will withstand lateral thrust, and can be modified to smaller nose angles and radii as required by specific profiling conditions.

Four shank sizes are available in three different styles — righthand, lefthand, and neutral, as illustrated in the sketches. See Catalog 52, page 45 for specifications. Confer with our Tool Engineers if you need help in this type of tooling—or any other. Kennametal Inc., Latrobe, Pa.

KENNAMETAL

CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY

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Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

FORGINGS, Drop

Bethlehem Steel Co., Bethlehem, Pa.

FORGINGS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Morgan Engrg. Co., Alliance, Ohio.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset

Bethlehem Steel Co., Bethlehem, Pa.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

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Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
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Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FORMING TOOLS or Tool Blanks

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.

(Continued on page 338)

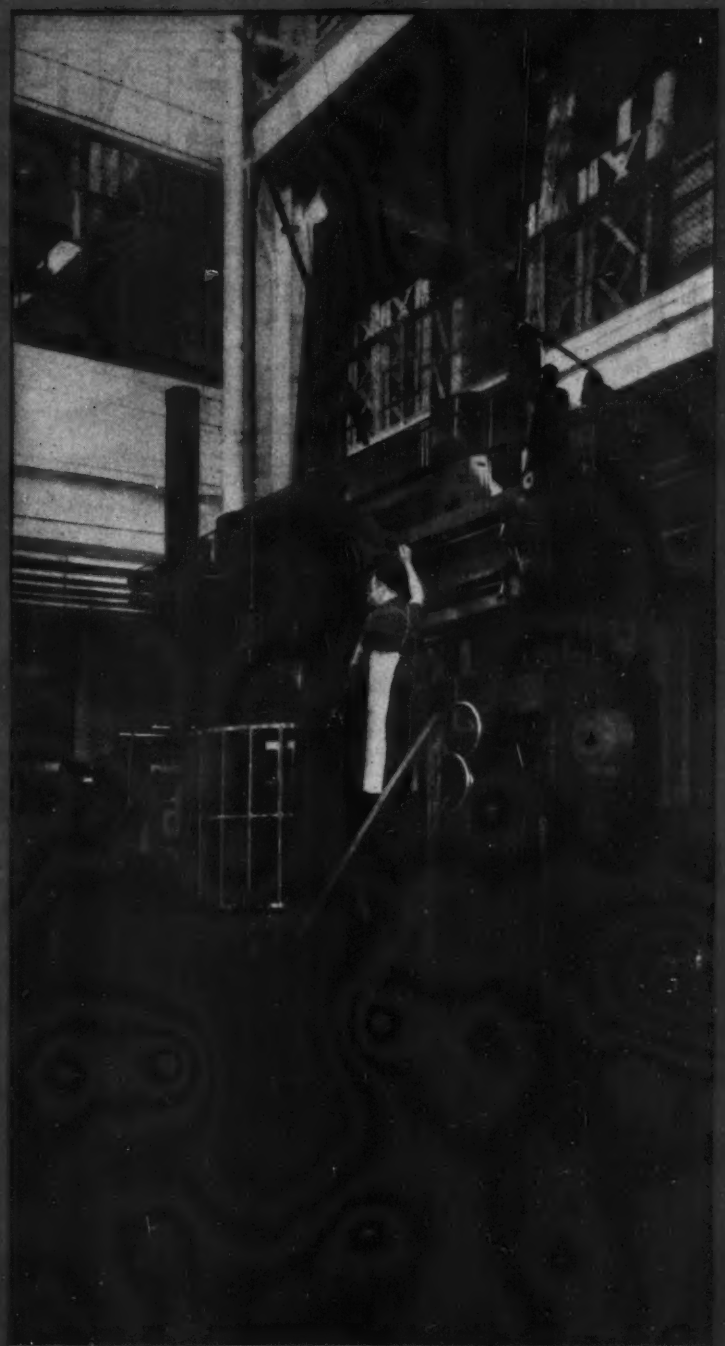
King is "Tops" on the HIGH Jobs

Here is a good example of how traditional KING ruggedness and accuracy can make a routine job out of an exceptionally difficult machining operation.

These "high" jobs tend to amplify any shortcomings in table bearing design. This is particularly so where the part is not only tall but a flimsy weldment. The support provided by a costly, specially-built fixture would compensate, at least to some degree, for lack of rigidity in the part—but the wide diversity of jobs run across this machine made it uneconomical to use other than the simplest of hold-down clamps. Since the machine is a KING . . . *extra*-husky, *extra*-rigid, *extra*-accurate . . . this support is entirely adequate and the customer is able to obtain excellent results in spite of the difficulties involved.

What have we here? Just one more bit of "on the job" evidence added to a multitude of reasons why it will pay YOU to get the facts on

KING VERTICAL BORING & TURNING MACHINES



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KING machines are made in ten sizes, all available in various bowl combinations. Catalog K-1 covers machines sizes 30", 36", and 42"; K-2 sizes 52", 65", and 75"; K-3 sizes 84" and 100"; K-4 sizes 120" and 144". Please specify sizes of machines in which you are interested.

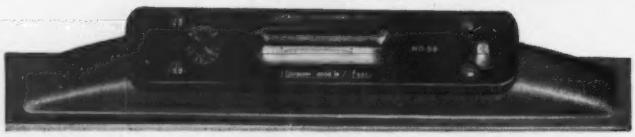


American Steel Foundries

KING MACHINE TOOL DIVISION

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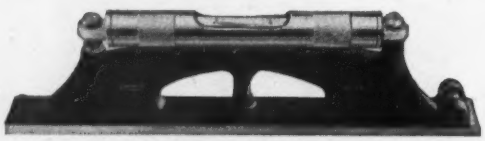
PREVENT
EXCESSIVE MACHINERY WEAR



NO. 59 MASTER PRECISION LEVEL ▲

NO. 58 MACHINISTS LEVEL ▼

with LUFKIN



MASTER PRECISION and MACHINISTS LEVELS

Longer bearing and spindle life is obtained through proper alignment. One of the causes of excessive wear to machinery can be avoided if the equipment is precisely level and in alignment. Lufkin No. 59 Master Precision Levels are widely used in machine shops, millwright departments, toolrooms, and inspection departments for the accurate setting, erecting, and testing of machinery and surface plates. Length of base is 15 inches.

Check these features of this outstanding precision level:

- Accurately ground and graduated vial of 10 second accuracy, one division equalling .0005 of an inch per foot
- Fine, positive adjustment with extra sensitive screws (64 threads per inch)
- Special alloy base casting is less affected by temperature changes
- Top plate made of a special non-conductive insulating material
- Auxiliary level shows lateral position
- Designed to give maximum protection to vials

Lufkin Machinists Levels are made from fine seasoned casting, insuring strength and rigidity. The shallow "V" in the base is preferred by mechanics and machine setters because better surface contact is obtained on various sizes of shafting. In addition to the main parallel vial, Lufkin Machinists Levels are equipped with a cross level and plumb vial. The main vial on the No. 58 is ground and graduated, with each graduation equal to .005 inch per foot. The vials on the No. 57 are plain. Micrometer type thread (40 threads per inch) permits fine adjusting. Outer metal tube can be turned to protect main level glass when not in use.

Free Information—write The Lufkin Rule Co., Saginaw, Michigan, for fully descriptive folders.

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Comtor Co., 47 Farwell St., Waltham 54, Mass.
DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
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Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
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Standard Gage Co., Inc., Poughkeepsie, N. Y.
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DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
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Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
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Starrett, The L. S., Co., Athol, Mass.

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Starrett, The L. S., Co., Athol, Mass.

GAGES, Electric

DoAll Co, 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
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GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
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(Continued on page 340)



how much can you save with a Lodge & Shipley COPYMATIC

SAVINGS REPORTED BY FAMOUS MANUFACTURERS

FIRM	PART	TIME SAVINGS
Automatic Transportation Co.	Armature shaft	55%
Bay City Shovels, Inc.	Worm gear shaft	70%
Canadian Arsenals, Ltd.	Heavy spindle	60%
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Link-Belt	Transmission shaft	50%
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D. H. Prutton Machy. Co.	Machine spindle	85%
Solar Aircraft Co.	Jet engine parts	22%
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If you have lathe work that's adaptable to the Lodge & Shipley COPYMATIC, there's no reason why you, too, can't enjoy savings comparable to those shown above. On every installation, owners report significant advantages. With one, it may be a time saving as high as 87%. With another, a production increase as much as 536%. Still another finds an overall saving of $14,000 in one year or the fact that one COPYMATIC replaced three older lathes.

Best of all, the COPYMATIC is so versatile, combining the speed of automatic duplication with the precision and adaptability of the famous Model X Lathe, practically any shop can use it profitably.

Write for detailed COPYMATIC case histories or a demonstration of your own parts on a COPYMATIC.

THE Lodge & Shipley COMPANY
3063 COLERAIN
CINCINNATI 25, OHIO

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Starrett, The L. S., Co., Athol, Mass.

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Brown & Sharpe Mfg. Co., Providence, R. I.
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DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Turner Bros, Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GAGES, Surface

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Detroit Tap & Tool Co., Detroit, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Roilway Corp., 806 Emerson Ave., Syracuse, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Waltham Machine Works, Newton St., Waltham, Mass.

(Continued on page 342)

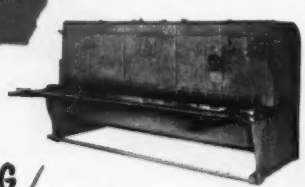


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Will shear mild steel up to 10 gauge . . . less curl and burring . . . no gears or clutch

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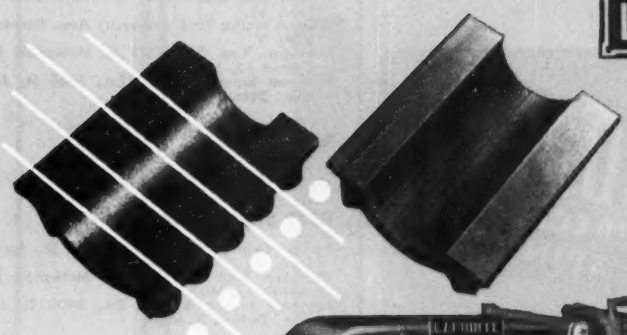
1440 per hour

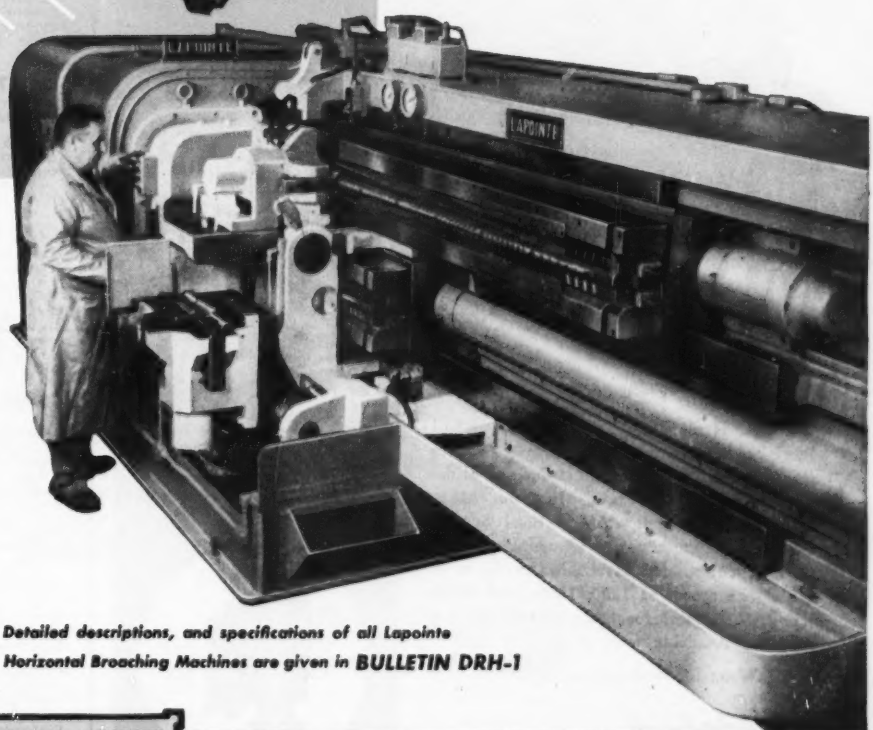
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This high production is accomplished on the

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Double Ram Horizontal Broaching Machine, 15-ton size, with 90-inch stroke . . . *using Carbide Broaches.*





Operating at 80 fpm cutting speed, these Main Bearing Caps are broached in clusters of 5, with the half-round, joint faces, and chamfered edges *all broached in one operation!*

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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)

Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Kelvin Systems Corp., 135 Front St., New York 5, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

GEAR FINISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

GEAR GRINDING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers.

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

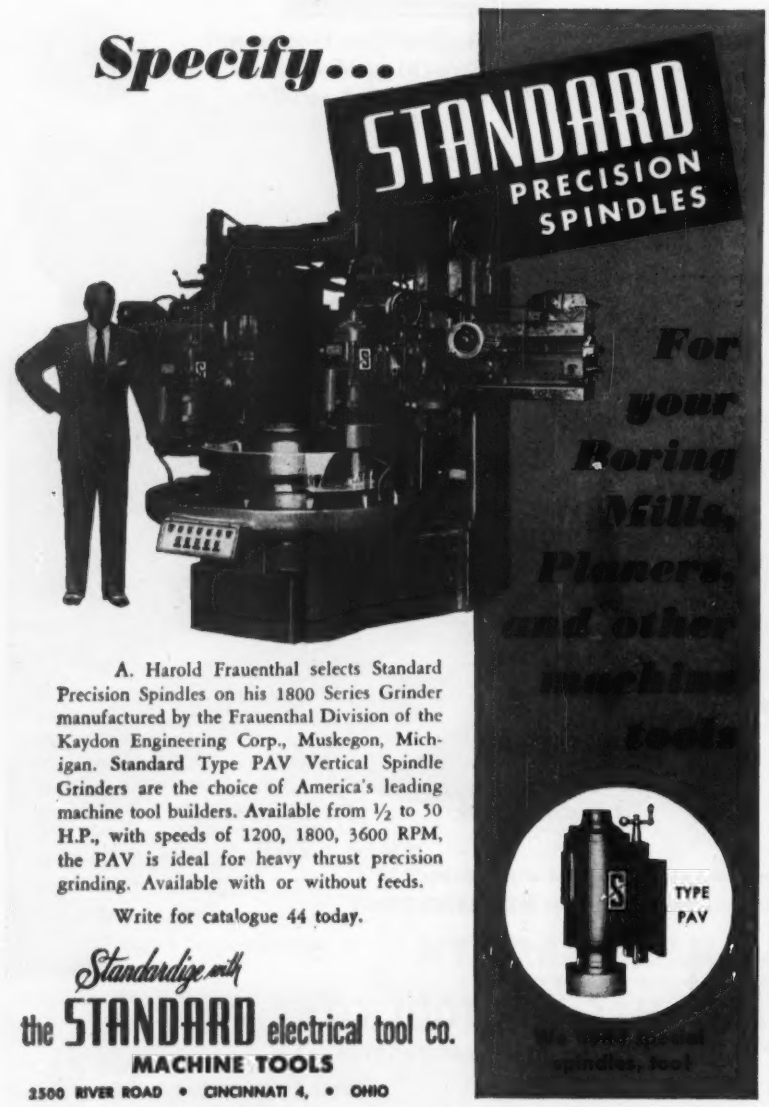
GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, Cut

American Stock Gear Div., Perfection Gear Co., Harvey, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Marlemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.

(Continued on page 344)



A. Harold Frauenthal selects Standard Precision Spindles on his 1800 Series Grinder manufactured by the Frauenthal Division of the Kaydon Engineering Corp., Muskegon, Michigan. Standard Type PAV Vertical Spindle Grinders are the choice of America's leading machine tool builders. Available from ½ to 50 H.P., with speeds of 1200, 1800, 3600 RPM, the PAV is ideal for heavy thrust precision grinding. Available with or without feeds.

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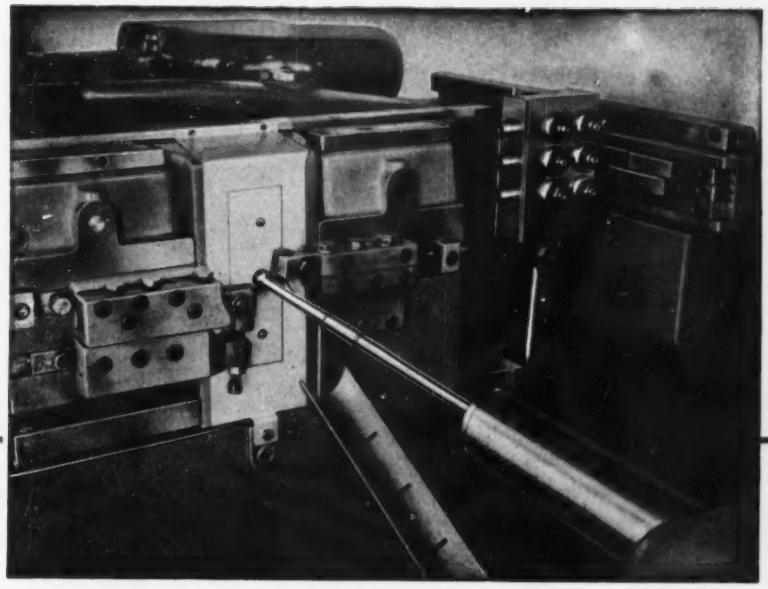
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CAPACITIES TO
2 3/8" DIA. & 21 5/8" LENGTH

Single Spindle Automatic Lathe



View shows set-up to produce this 21 5/8"-long piece.

Headstock feed permits all turning operations to be performed at point of support.

Rugged construction throughout. All tool adjustments readily accessible. Camming simple to make and apply.

SIX CROSS SLIDES

SIX END TOOLS

Precision • Flexibility • High Production by

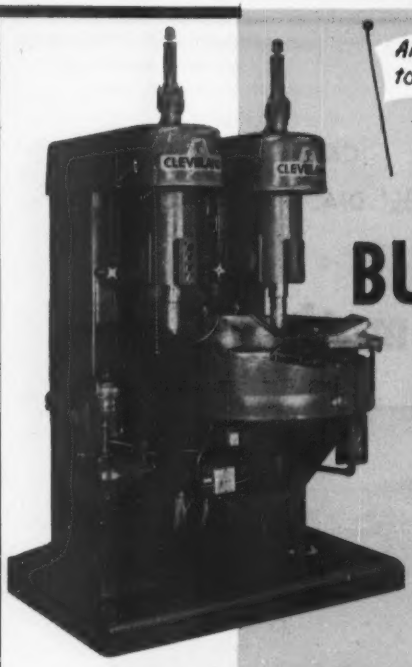
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292 MADISON AVENUE, NEW YORK 17, N. Y.



Another Cleveland Design to Speed Production!

MORE BUSHINGS— FASTER!

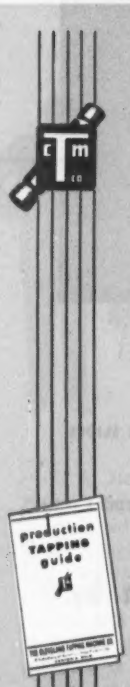
MODEL E4U DUPLEX FOR 1¼" to 2½"

To get maximum speed on larger bushings Cleveland designed this Duplex machine with a 6 station hydraulic table. It will drill and tap 1¼" to 2½" bushings with a production of 730 pieces per hour of the 2½" size at 100% efficiency. Production of smaller sizes is of course considerably higher.

Like all Cleveland Tapping Machines it utilizes the now famous precision lead screw feed that assures you of more perfect pieces at top speeds. The result is lower costs.

Keep in mind that over the years Cleveland engineers have been designing special tapping machines to meet a varied range of requirements, often combining several operations in one machine. This accumulated know-how can be put to work for you. A machine designed by Cleveland engineers to meet your special requirements will definitely result in lower production costs.

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This Tapping Guide has invaluable information for engineers and operators. Send for your copy.

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For Better Tapping - - Faster!

CLEVELAND lead screw tapping machines



Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Sier Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic

American Stock Gear Div., Perfection Gear Co., Harvey Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Elec. & Engrg. Co., Collinwood Sta., 1088 Ivanhoe Rd., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GOGGLES

American Optical Co., Southbridge, Mass.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

GREASE

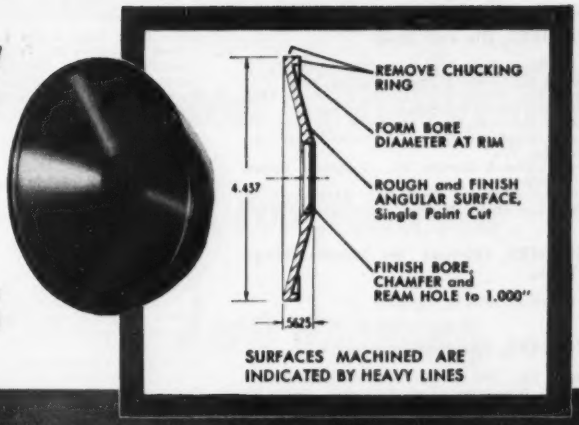
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

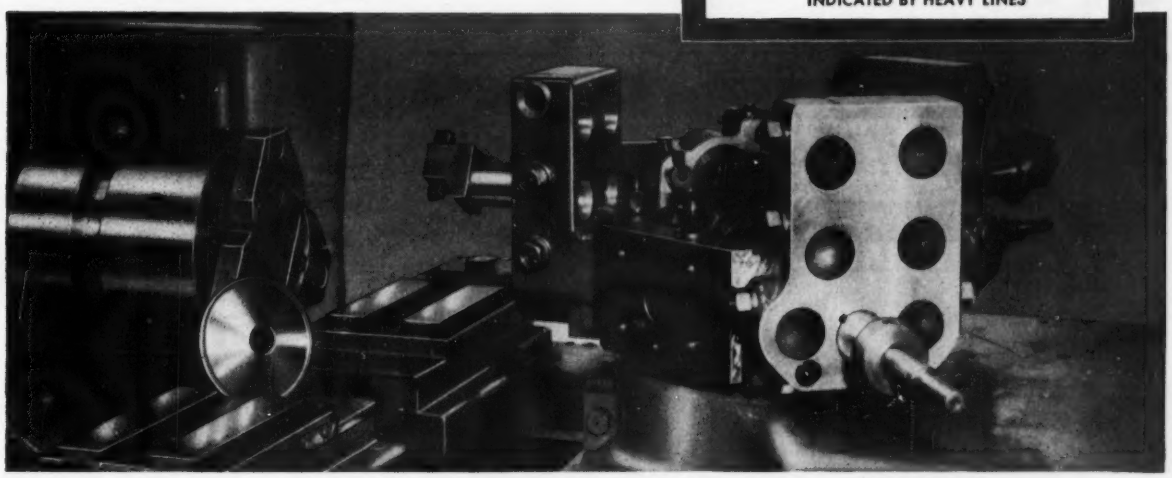
GRINDERS, Carbide Tool

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

(Continued on page 346)

Here's an EASY WAY to machine Forged Steel End Caps





Use a 3U SPEED-FLEX Automatic Turret Lathe with P & J Tooling

Designed, engineered and built for rapid, accurate, economical production, the 3U Speed-Flex takes full advantage of carbide cutting tools for quick metal removal on a variety of small to medium size work. P&J Tooling will also make a big difference wherever the profitable machining of difficult jobs demands added efficiency.

FOR THE ULTIMATE in speed, precision and economy you need **both** P&J Automatics and P&J Tooling . . . industry's outstanding team for higher output, lower unit costs and improved work quality.

Machine your hard-to-handle jobs easier and better, the P&J way. Send today for your copy of the 3U Bulletin No. 145 — or ask the P&J Tooling Engineer to submit recommendations based on your own sample parts or prints.



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AGENTS: DALLAS, THE STANCO CO.
HOUSTON, WESSENDORFF, HELMS & CO.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic

Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Conn.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Dumore Co., 1300 17th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Madison Mfg. Co., Muskegon Heights, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Besly-Welles Corp., Beloit, Wis.
black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, Geo., Mich. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co. Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Diversified Metal Products Co., 5125 Alcoa Ave., Los Angeles 58, Calif.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Inc., Waynesboro, Pa.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GRINDING MACHINES, Chucking

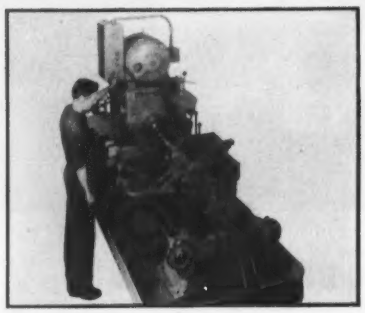
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Landis Tool Co., Inc., Waynesboro, Pa.

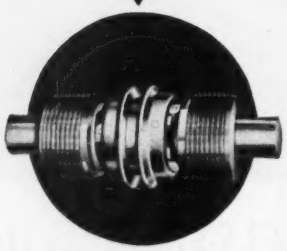
GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

(Continued on page 348)

This Lathe "Works Both Ends Against The Middle"





The Lodge & Shipley DUOMATIC LATHE features independently actuated front and rear carriages and tool slides; permitting simultaneous or independent operation of the front and rear cycles, ROCKFORD CLUTCHES both drive and brake the main headstock drive. Let ROCKFORD clutch engineers help plan versatile power transmission controls for *your* machines.

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B-W PRODUCTION MAKES IT AVAILABLE



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ROCKFORD CLUTCHES

Here's the difference between Hydroforming and conventional deep drawing

CONVENTIONAL METHOD

Fig. 1 shows the forming of a hemisphere with a standard draw die equipped with a die cushion. For satisfactory drawing, an accurately controlled, infinitely *variable* blank holding pressure during the drawing cycle is most desirable and such a feature is rarely available on conventional presses.

Conventional tooling requires that the material be drawn over a fixed die radius. A very small die radius may cause spot stresses, thin-out and tearing. A very large die radius may cause wrinkles and puckers to be formed in the part.

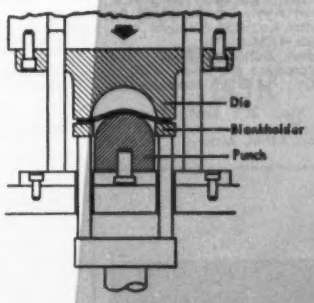


Figure 1

HYDROFORM METHOD

Note in Fig. 2 the simplicity of tooling required to produce the same hemisphere by Hydroforming.

Pressure in the forming cavity above the flexible diaphragm can be established to the setting desired. The flexible diaphragm acts as a blank holder and universal die, applying pressure uniformly over the entire blank surface. This, in some instances, accomplishes a preliminary forming of the part. Then the punch is moved upward and proper control of the pressure in the forming cavity forms the material to the punch.

The forming cavity pressure normally increases throughout the draw, causing the forming or draw radius to decrease progressively, as shown in the photo at right. This transition of the radius from large to small facilitates the "flow" of the material. Those portions of the blank which have been formed are held firmly in contact with the punch, preventing further stress or strain in those areas. The continuous wrap-around action of the flexible die member, plus the accurately controlled forming pressure, produces consistently uniform parts, free from the defects described above.

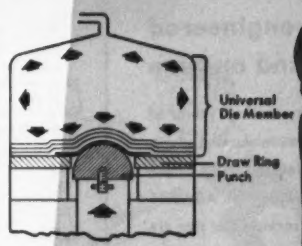
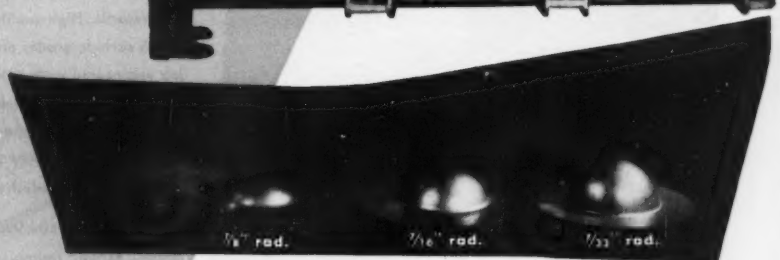


Figure 2

CINCINNATI 12" HYDROFORM
Also built in 19", 23", 26" and 32" standard sizes. Write for Bulletin M-1759-1.





Can you convert the advantages of Hydroforming into production profits?

Through Hydroforming, deeper draws and more intricate shapes can be formed in one operation than is possible by conventional forming methods. Tool costs are reduced 50% or more. Part quality is materially improved. Short-run production is made exceptionally economical. Can you apply these Hydroforming advantages to your production? Call in a Cincinnati Milling field engineer.

CINCINNATI Hydroform

THE CINCINNATI MILLING MACHINE CO.
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Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

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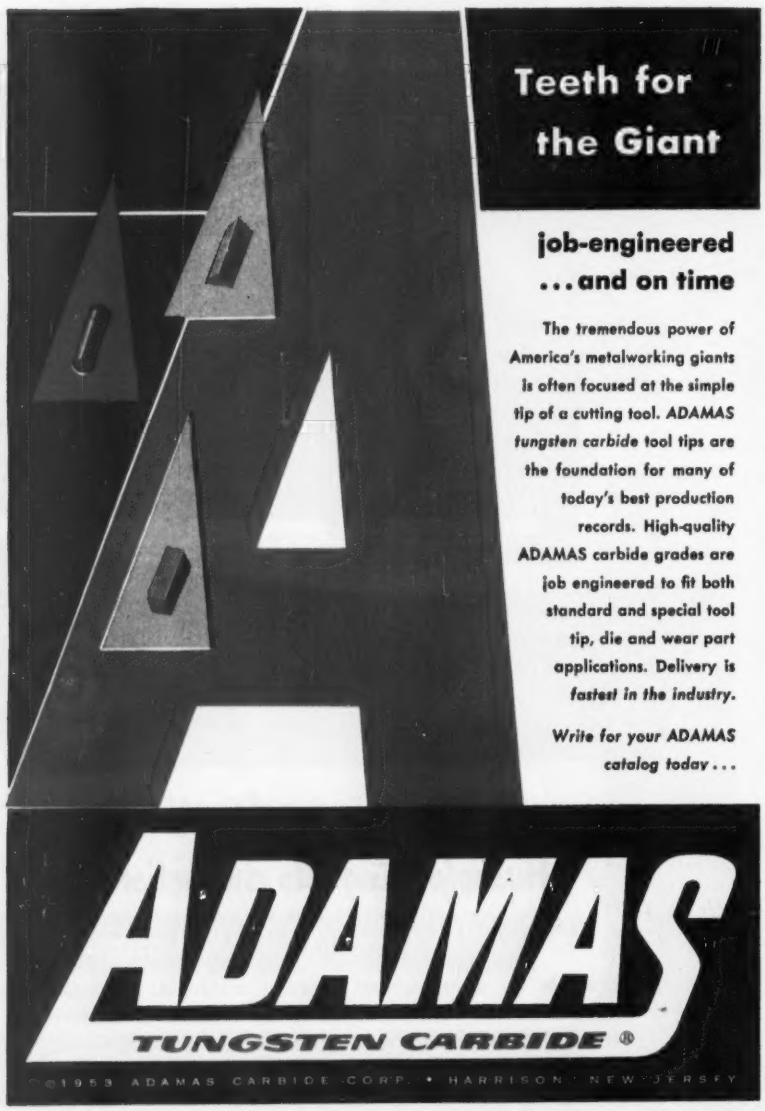
Eastern Mch. Screw Corp., New Haven, Conn.
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Besly-Welles Corp., Beloit, Wis.
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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
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Pratt & Whitney, West Hartford 1, Conn.
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Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

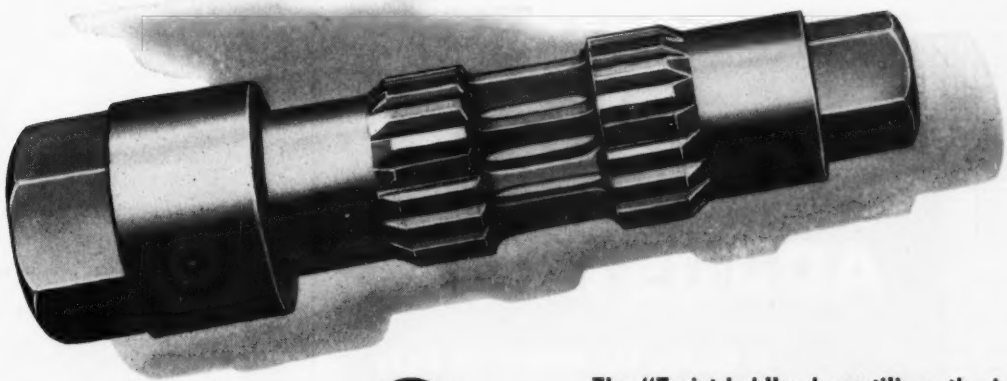
GRINDING MACHINES, Internal

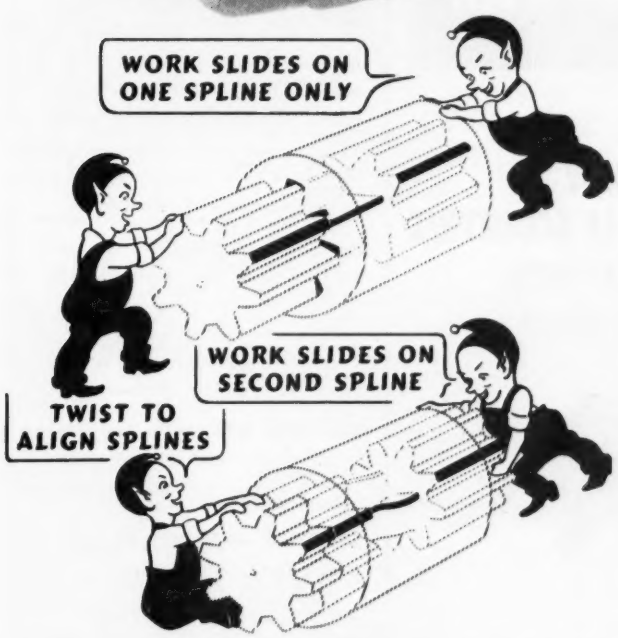
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Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
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Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
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(Continued on page 350)

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(Continued on page 352)

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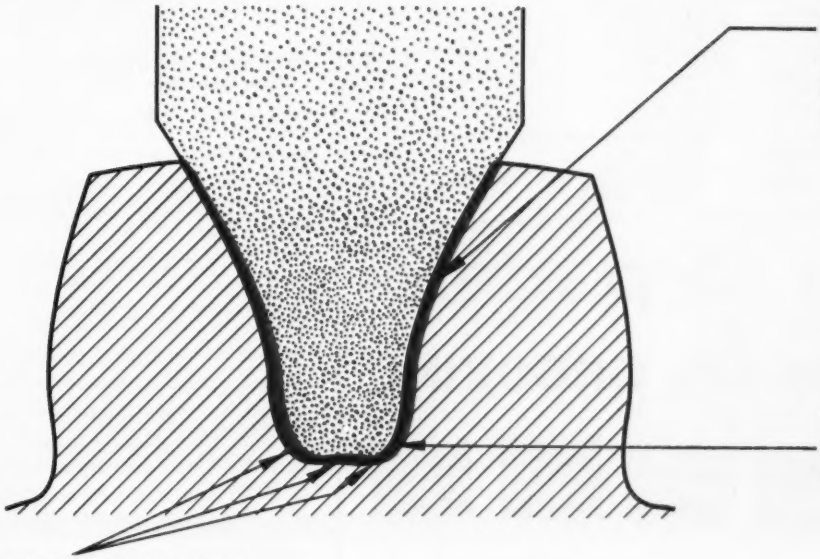
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
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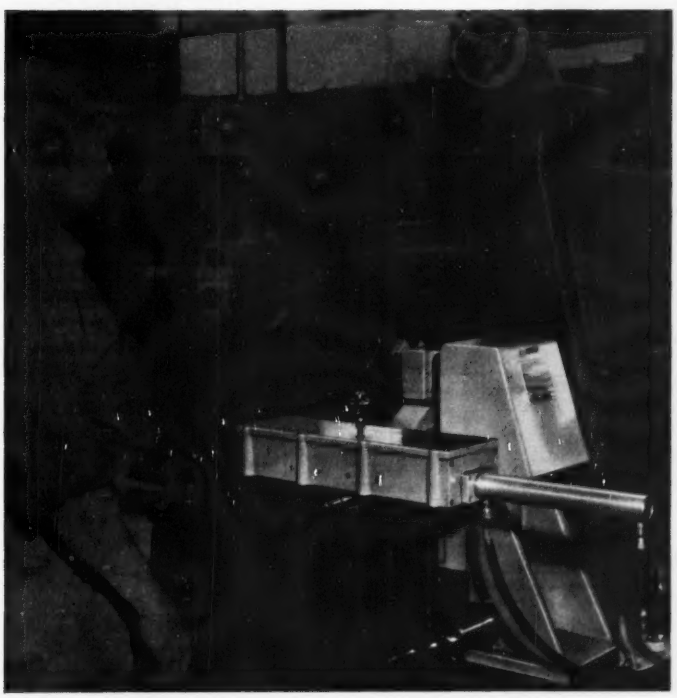
Bethlehem Steel Co., Bethlehem, Pa.

(Continued on page 354)

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The Hoglund Hydraulic Spline and Gear Contour Dresser mounted on a machine grinding high-precision aircraft gears

THE elimination of stress concentration at the root fillet is important in all gears and splines, but especially so in aircraft work. The Hoglund Automatic Hydraulic Dresser produces a smooth blending of all curves and tangents, plus . . .

1. Wheel dressed in one operation.
2. Contour template with 10:1 ratio controls diamond movement.
3. *Pantograph linkage eliminated.* Reduction from template is by inclined planes, resulting in greater accuracy.
4. Capacity up to 0.75" wheel.

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Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
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Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
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Watson-Stillman Co., Div., H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

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Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, John S., Corp., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

INDEXING AND SPACING EQUIPMENT

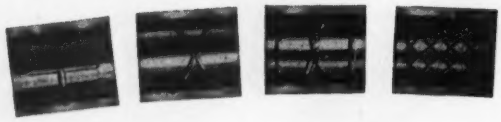
Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Bellows Co., 230 W. Market St., Akron, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Homestrand, Inc., Larchmont, N. Y.

(Continued on page 356)

High Speed
CONTINUOUS OIL GROOVING



500
PIECES PER HOUR!

High-production and economical operation are the features of the WICACO CONTINUOUS OIL GROOVER . . . capable of completing as many as 500 grooved pieces per hour in routine practice —even with unskilled labor!

The operator loads and unloads the work **without stopping the Machine** — a valuable time-saving advantage made possible by the WICACO upright construction of the spindle and stationary chuck. Feed-lever automatically returns to neutral position when cutting tool reaches its proper depth. The spindle—not the chuck—revolves, permitting fast and convenient grooving of a variety of larger and irregular work. Maximum depth of groove 7/32", maximum width 3/8", grooves may be cut in work from 1/4" I.D. to 4 1/2" I.D.; standard chuck holds work to 4 1/2" O.D.; stroke of spindle from 0" to 7"; floor space 24" dia.; weight of machine about 950 lbs.



Send us sample bearings to cut to specifications. We will return them, properly grooved, with a record of the time required and a cost-estimate. No obligation. Or, write for detailed, well-illustrated Bulletin.

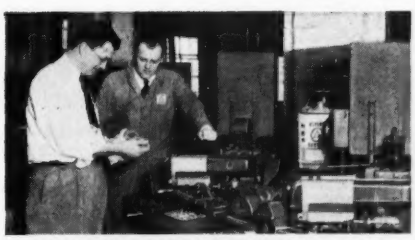
WICACO

SINCE 1868

THE WICACO MACHINE CORPORATION
WAYNE JUNCTION PHILADELPHIA 44, PA.



Cities Service Cutting Oils Proved The Very Best By Micrometer Test!



CUTTER MEASURED WITH MICROMETER. As a final test, Automatic Pencil Sharpener measures each cutter with a micrometer. All tests proved that Cities Service cutting oil was absolutely tops for this really tough job.



STRICT SPECIFICATIONS REQUIRE FINEST CUTTING OIL. APSCO Sharpeners offer many more features than other brands. To produce their top quality product, Spengler-Loomis relies on top-quality lubrication products . . . Cities Service Products, famous throughout industry.

ONLY .005 INCHES BURR OR BUILD-UP ALLOWED IN FIFTY-HOUR OPERATION CUTTING GROOVE IN B1112 STEEL!

Says Mr. C. J. Kostrzewa, Plant Superintendent: "Cutting oil requirements in our Automatic Pencil Sharpener Division are tough. To find the right coolant, we called for, and tested, samples from various companies. Over a period of testing time, we used graphs, charts and tables, keeping a running record on all coolants. As a final test, we measured the cutter with a micrometer before and after milling. The cutting oil that came out tops was Cities Service.

"I'd also like to point out that the Cities Service Engineering staff co-operated fully by offering helpful advice and excellent service."

Why not discuss your lubrication problems with a Cities Service lubrication engineer? Write Cities Service Oil Company, Dept. C12, Sixty Wall Tower, New York 5, New York—or contact your nearest Cities Service office.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

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Bristol Co., Platts Mills, Waterbury, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

INDICATORS, Test

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

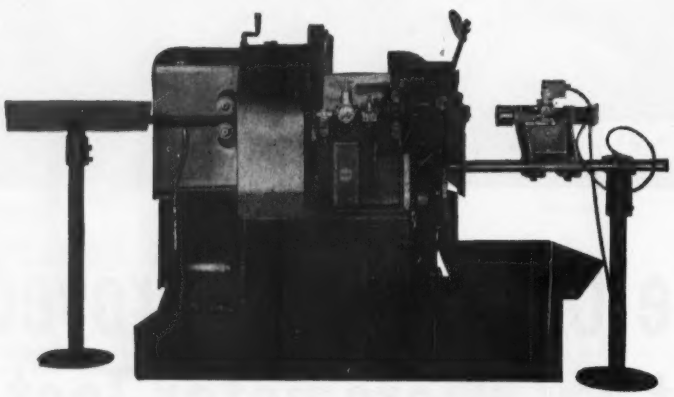
INTENSIFIERS, Hydraulic

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Farquhar, A. B., Co., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.

The NEW MODERN AUTOMATIC
CUTTING-OFF MACHINE



Cuts Off Tubing, Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off *any length you want*—and cuts it *faster*. If your production *requires* quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

1/2" Tubing

This machine cuts off and chamfers both outside edges of ½" .030 wall tubing, 5" long, at the rate of one every 2.5 seconds.

1 1/4" Cold Rolled

This machine cuts off and chamfers both ends of 1¼" cold rolled, 20" long, at the rate of one every 20 seconds.

1" Tubing

This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 6¾" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

4" Threaded Studs



Cut and chamfered at one time—in 8 seconds—from 10 ft. length of stock already threaded. (¾" U. S. Standard.) Clean cut. Clean chamfer. Nuts start easily, with no extra finishing required.

WRITE FOR ILLUSTRATED CATALOG.

MODERN MACHINE TOOL CO.
Michigan

JIG BORER

See Boring Machines, Jig.

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Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Logansport Machine Co., Inc., Logansport, Ind.
Mathewson Machine Works, Inc., 28 Hancock St., Quincy 71, Mass.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.
Woodworth, N. A., Co., 1300 E. Nine Mile Rd., Detroit 20, Mich.

JOINTS, See Fittings, Hydraulic, Pneumatic, Etc.

KEYSEATERS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginaw, Mich.
Morton Mfg. Co., Muskegon Heights, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.

LAPPING MACHINES

Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.).
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

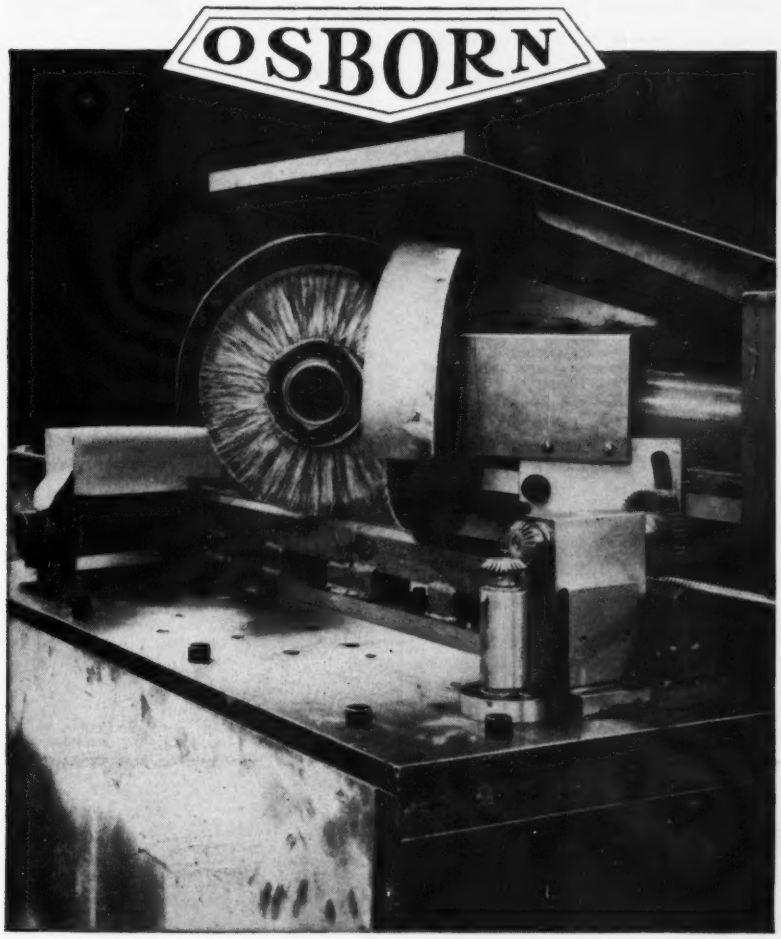
LATHE AND GRINDING DOGS

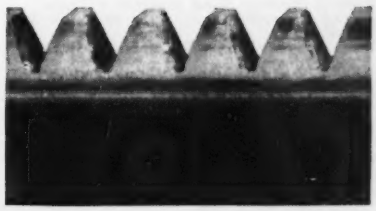
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

LATHE ATTACHMENTS

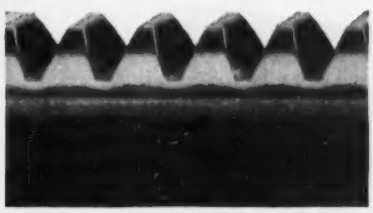
American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hendey Machine Co., Inc., Torrington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.

(Continued on page 358)









BEFORE AND AFTER. Top view shows closeup of rack teeth with light burrs and rough surface before brushing by new "push-button" method. Center view shows closeup of rack in machine after completion of brushing. Bottom view shows teeth after brushing. Note uniform surfaces and smooth finish on all teeth.

Formerly 50 minutes...
Now brush-deburred in 6 minutes

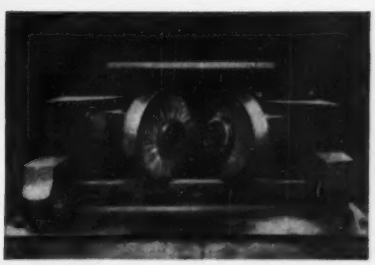
8 times as fast . . . more uniform deburring . . . finer surface finish. These are the advantages gained by a large machinery manufacturer with an automatic power-brushing method. The part: a rack gear, 17 ft. long with more than 1000 teeth. The job: light deburring of machine-cut teeth, and blending the junctures of intersecting surfaces to form smooth curves in place of fragile, sharp edges.

With the help of their **O**sborn **B**rushing **A**nalyst, they devised the machine shown above. This automatically controlled machine with two heads of Osborn Fascut® brushes does the entire job in 6 minutes. Burr removal and surface juncture blend are far superior to former methods.

This is typical of thousands of cases where production is being vastly improved with Osborn power brushing methods. Find out how you can cut *your* costs! Call in your **OBA** today or write *The Osborn Manufacturing Company, Dept.D-3, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



HOW IT'S DONE. Two rotating Osborn power brushes, engage rack teeth at angles as shown. At push of button, rack drives through machine at about 5 ft. per minute. When the rack completes passage, the drive reverses and sends it back in the other direction. On return travel of part, the direction of brush rotation is reversed to contact surfaces on the opposite side of rack. This gives both sides of teeth uniform brushing.



WHAT'S YOUR PROBLEM? The nearby Osborn Brushing Analyst is experienced in working with machine designers and methods engineers to solve problems with the latest power brushing techniques. Feel free to call him for help!

Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turnomat Co., Inc., Brockport, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHE CONVERTER

Master Mfg. Co., Hutchinson, Kansas.

LATHES, Automatic

Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10 Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russel, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Ames Precision Mch. Works, Waltham, Mass.
British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn.
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LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
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Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Duplicating

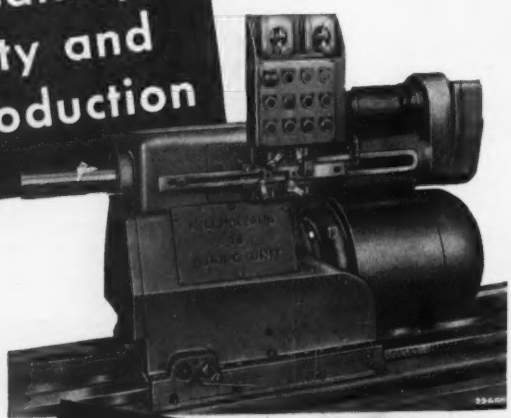
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Monarch Machine Tool Co., 27 Oak St., Sidney Ohio.
Sidney Machine Tool Co., Sidney, Ohio.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

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American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hendey Machine Co., Inc., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.

(Continued on page 360)

For Versatility Flexibility and High Production



MILLHOLLAND'S *New* AUTOMATIC BORING UNIT

Here's a new fixed center Horizontal Boring Mill unit that quickly gives you toolroom accuracy and production speeds—plus versatility!

Specially designed for short and medium run jobs, a single Millholland Automatic Boring Unit can be used for a variety of jobs, and one or more units can be mounted on a bed to perform a wide range of operations. Automatic operation replaces manual lever shifts, giving a complete automatic feed cycle. Hydraulic feeds are infinitely adjustable.

The body is heavily proportioned throughout for maximum rigidity. The hardened steel alloy spindle reciprocates thru hardened steel bushings mounted in the sleeve. The sleeve is contained in two precision Timken bearings.

SPECIFICATIONS

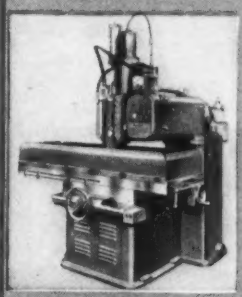
Horsepower	5 to 10	Diameter of spindle	3"
Spindle speeds by pick-off gears	33 to 500 rpm	Morse taper of spindle	No. 5
		Length of stroke	10"

Send for Catalog M-311

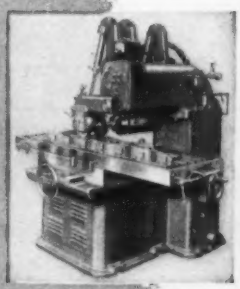
Get more information about this new Millholland Automatic Boring Unit. Let us show you how efficiently they can be applied to many of your horizontal boring mill operations.

W. K. MILLHOLLAND MACHINERY COMPANY, INC.
6402 WESTFIELD BLVD.
INDIANAPOLIS 20, INDIANA

for high speed non-ferrous milling



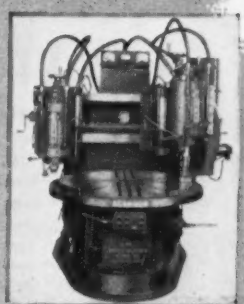
Onsrud A-24 Milling Machines . . . high HP, high speed milling heads, remove metal at rates up to 2½ cubic inches per minute. Table feeds infinitely variable from 11" to 215" per minute. 3,450 RPM horizontal head pivot mounted for contour milling with profile bar control. Write for Bulletin 1139.

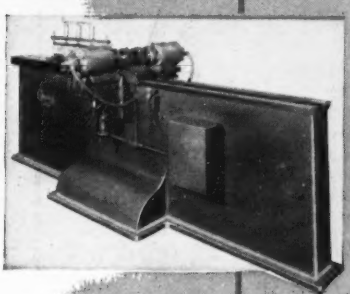




Onsrud A-245 Vertical Milling Machine . . . for light work, manually fed as in sheet profiling and cut-out operations. Two speed 7,500 and 15,000 RPM spindle provides smooth finish and fast production.

Onsrud A-48 Rotary Table Face and Profile Milling Machine . . . for work or work set-up, up to 48" diameter. One pivoted head follows profile bar for contour or straight milling. Second head is preloaded for face milling.





Onsrud A-242 Duplex Milling Machine . . . mills parallel faces on work at one time, using end milling cutters. A high precision machine, built with one, two, or more motors as specified. Write for Bulletin 1128.

Onsrud A-18 Rotary Table Profile Milling Machine . . . dual table design permits loading while second table is in operation. For continuous production. Write for Bulletin 1124.



There's an Onsrud high speed, high HP, fast feed milling machine for every type of non-ferrous milling . . . to meet the requirements of every type and size of production part. Your inquiry is invited.

ONSRUD MACHINE WORKS, INC.
3940 Palmer Street • Chicago 47, Illinois

Onsrud

the fastest machines in metal working

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Corp., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Corp., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co, 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Seneca Falls Mch. Co., Seneca Falls, N. Y.

CUT... OPERATING — MAINTENANCE — SPOILAGE COSTS!

ON YOUR TAPPING JOBS!



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The exclusive Procunier "Tru-Grip" tap holder is lighter, smaller in diameter. It affords easier tapping close to walls or shoulders, eliminates "chewed" tap shanks. Holds tap true.

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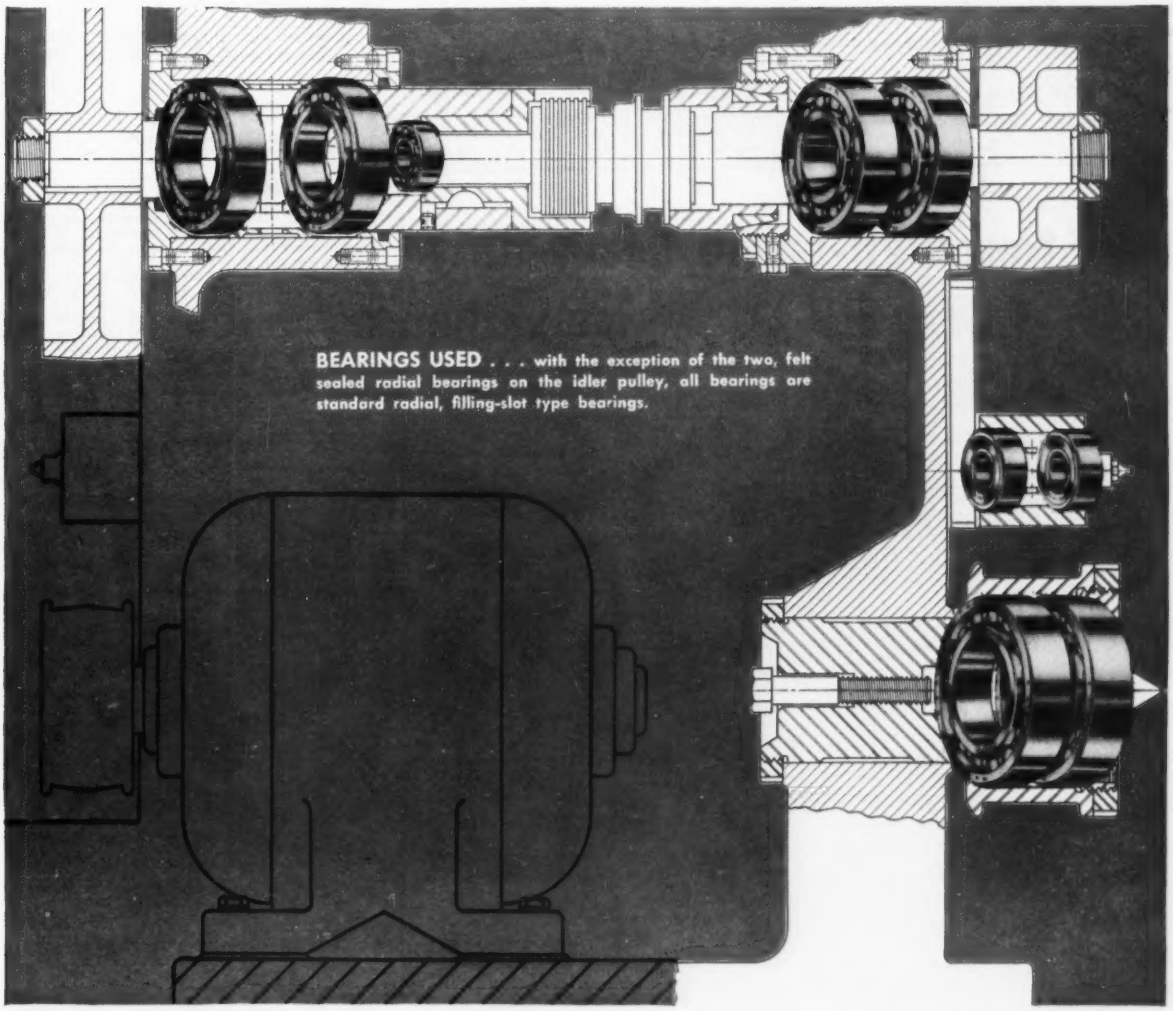
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(Continued on page 362)

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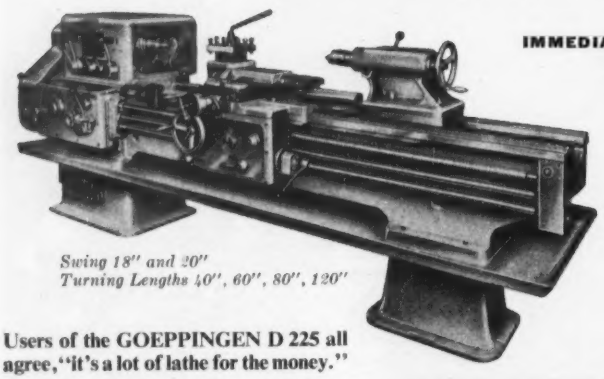
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(Continued on page 364)

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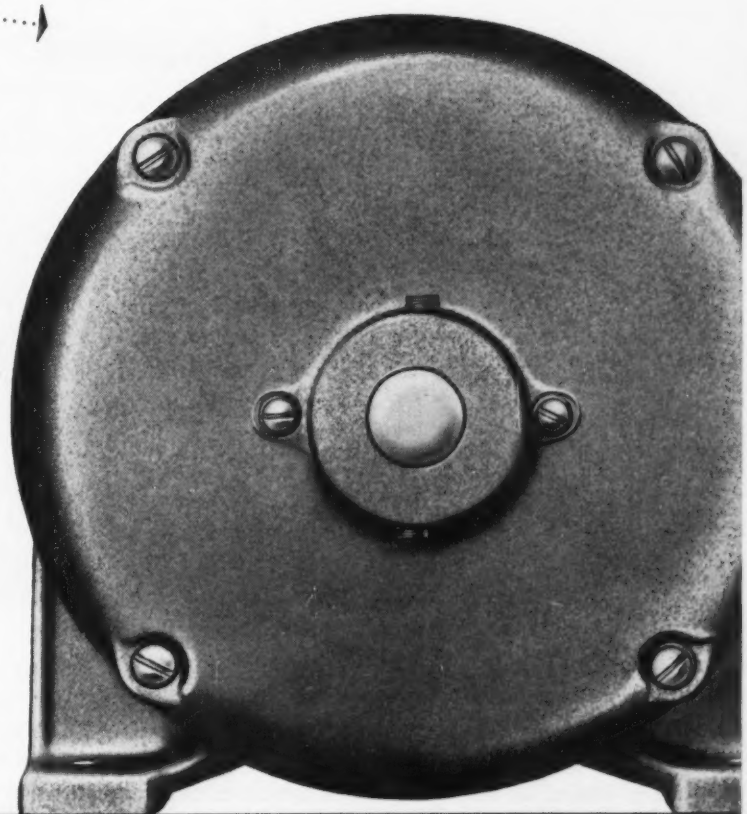
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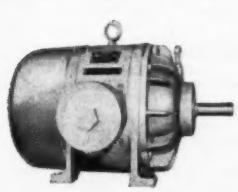
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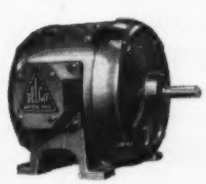
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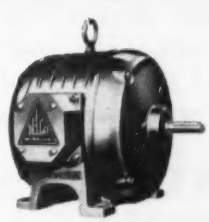
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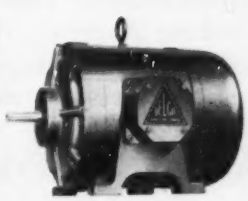
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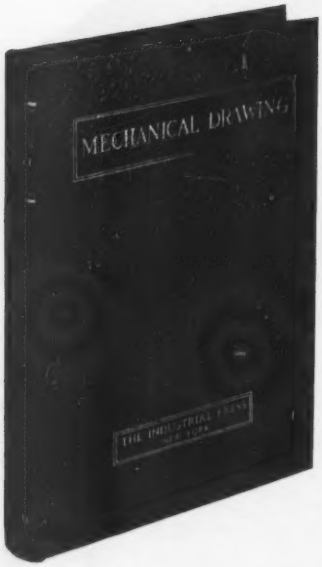
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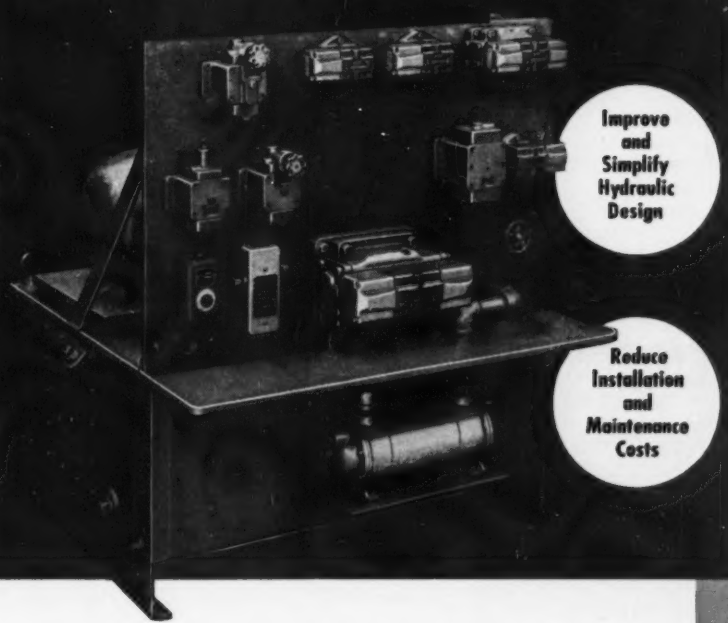
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(Continued on page 366)

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De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

OIL-HOLE COVERS

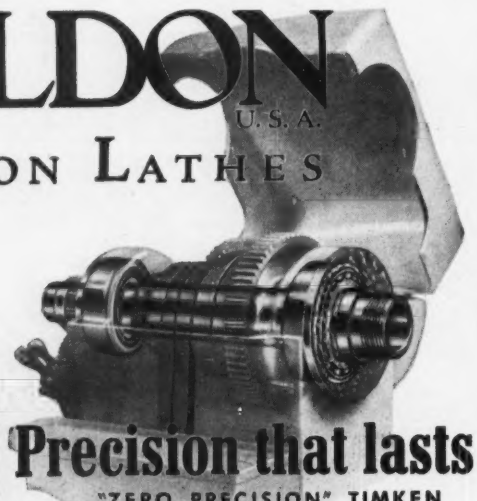
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

(Continued on page 368)

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CHICAGO U. S. A.
PRECISION LATHES



SHELDON
"Stamina" Features:

- Rigid, Heavily cross-strutted 1-piece Beds—2 V-ways, 2 Flat ways
- Full Double-Walled Aprons—all gear shafts supported on both ends
- Heavy Carriage with wide bearing on bed.
- Twin V-Belts to Spindle for extra power.



Precision that lasts

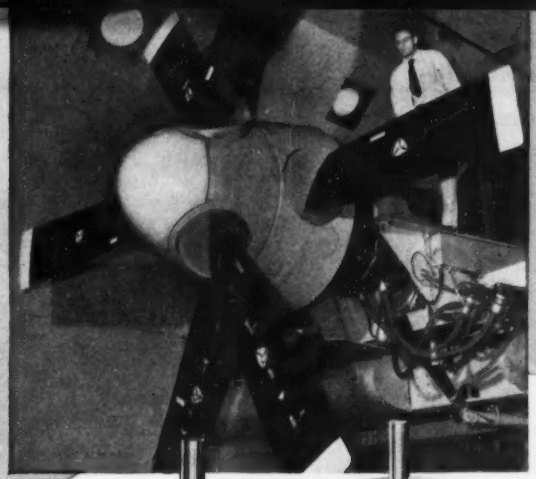
. . . "ZERO PRECISION" TIMKEN TAPER ROLLER BEARINGS

No lathe can be more accurate than its spindle bearings. Hence before buying any lathe one should check the *exact* type and tolerances of bearings used.

The No. TS-56B (and several other) SHELDON Precision Lathes have Timken "Zero Precision" Taper Roller Bearings, held to tolerances of .00015". Not only are these the most accurate bearings used in any lathe, they are the sturdiest type . . . hold their accuracy thru long hard use . . . hold it even under abuse. With the other stamina features built into SHELDON Precision Lathes, they assure continued accuracy, without costly maintenance, thru years of hard service.

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SHELDON MACHINE CO., INC.
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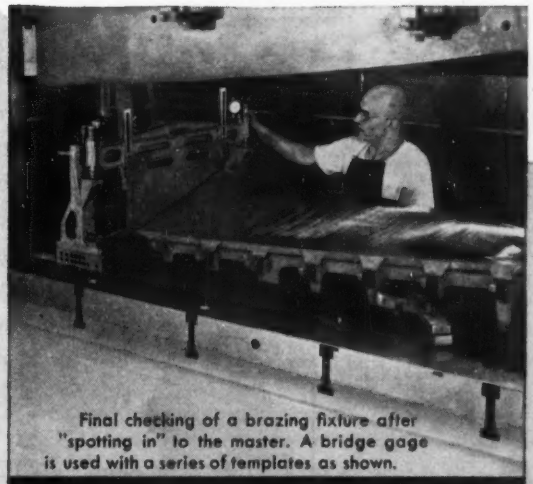


High speed aircraft propeller on test stand—built from tools "spotted in" in a DANLY SPECIAL DIE SET.



DANLY SPECIAL DIE SET, 46 by 140 inches, used for both production and checking of aircraft propeller tools.

DANLY SPECIAL DIE SETS



Final checking of a brazing fixture after "spotting in" to the master. A bridge gage is used with a series of templates as shown.

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Here's proof . . . this Danly Special Die Set is used by one of the country's leading aircraft propeller manufacturers for "spotting in" all contour tools for a complete production line. Accuracy is a must because the tools, masters for duplicating planers and profilers as well as holding fixtures, must mate closely with the master pattern and with each other in the sequence of operations.

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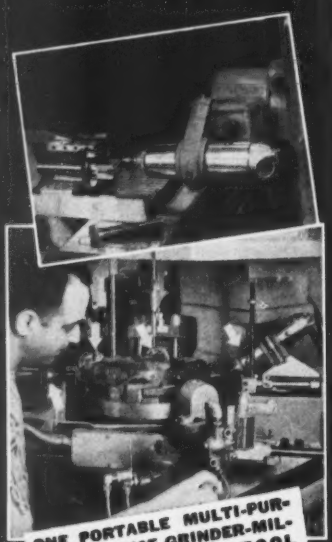
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FOR TOOL ROOM AND PRODUCTION



ONE PORTABLE MULTI-PURPOSE PRECISE GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!



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Madison-Kipp Corp., Madison, Wis.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lubricating

Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

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Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
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Sinclair Refining Co., 630 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

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Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.

ORDNANCE MACHINES, Special

Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.

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Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PHOSPHOR BRONZE—See Bronze.

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C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Shafer Bearing Corp., Downers Grove, Ill.
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(Continued on page 370)



pointing problems?

Torrington Swaging Machines produce pointed ends on both solid and tubular work to close tolerances. The swager, delivering 4000 hammer blows a minute, works rapidly and gives the metal toughness and resiliency. Swaging is economical, too, for there is no stock waste.

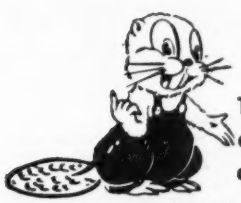


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Their unique features have earned for Zagar gearless drillheads a permanent place in many industries. Examples: gas burners, acoustical tile, parts for aircraft (jet engines), business machines, electrical appliances, automotive and farm machinery; drilling cast iron, stainless steel, paper, fiber glass, magnesium, aluminum, brass and copper.

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Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

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Landis Machine Co, Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

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Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLASTIC AND PLASTIC PRODUCTS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

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Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

PLATES, Angle

Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.

PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pratt & Whitney Div., West Hartford 1, Conn.
Rahn Granite Surface Plate Co., 637 N. Western Ave., Dayton, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 8855 Schaefer Highway, Detroit 27, Mich.

PNEUMATIC EQUIPMENT

Bellows Co., 230 W. Market St., Akron, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Logansport Machine Co., Inc., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

POLISHING LATHES AND MACHINES

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Gardner Machine Co. (Div. Landis Tool Co.), 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Jarvis, Charles L., Co., Middletown, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads.

PRESSES, Air

Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.

PRESSES, Arbor

Bellows Co., 230 W. Market St., Akron, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
duMont Corp., Greenfield, Mass.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Die Tryout

Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.

(Continued on page 372)



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Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Hydraulic

American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Sheet Metal Working

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

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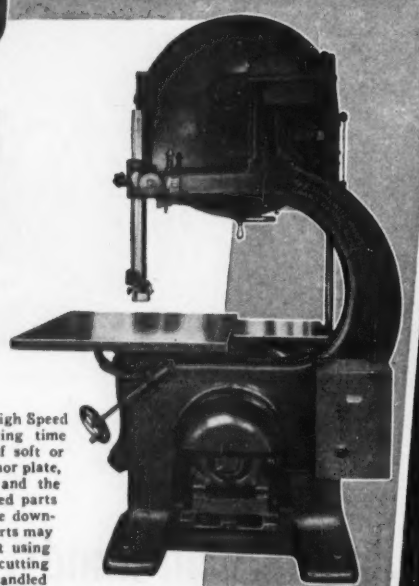


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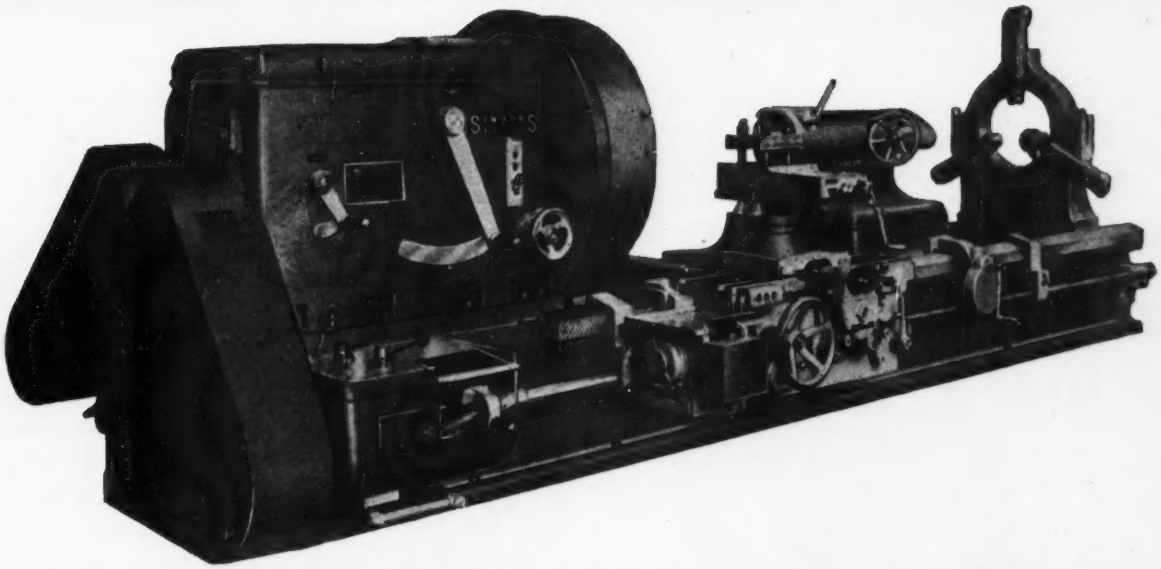
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EXTRA-HEAVY ENGINE LATHES

IN 48—54—60" SWING

MORE POWER + MORE RIGIDITY

Here's the strength and power you need to push carbide tools through a full range of speeds and feeds

Want proof that this new engine lathe can produce your heavy facing, turning and threading work in a hurry? Just look at these new features:

Main drive motors now available in 30, 40, 50 or 60 HP. The wider bed now has a strength-giving continuous flange along its underside. Complete new gear box provides a range of threads from ½ to 56 per inch. Lead screw is now 3½" in diameter; tailstock spindle has been increased to 7" diameter. Anti-friction bearings throughout.

Can be modified for your special needs

These standard lathes can be readily adapted to your particular production plans. Our engineers will work with yours to bring it about quickly and economically.

The next step? Write, wire or phone for more details. It's your *first* step towards increased output or heavy turning, facing or threading work.

FOR MORE INFORMATION:

Simmons Machine Tool Corporation

Main Office and Plant: 1600 North Broadway, Albany 1, N. Y.

Export Office: 50 East 42nd Street, New York, N. Y.

Philadelphia Office: Phone VIctor 8-3133 • Pittsburgh Office: Phone PEnhurst 1-3700

Specifications for Simmons Extra Heavy 48" Engine Lathe

RANGE Swing over bed ways: 51"; over carriage bridge: 36"
Distance between centers, 20 ft. bed: 10'

SPEED Range with variable voltage drive: RPM 1 to 144; through face plate: RPM 1 to 44
With direct current: RPM 3 to 144; through face plate: RPM 3 to 44

HEADSTOCK Hole through spindle, dia. 4"; taper of centers, Morse: No. 7
Diameter of face plate: 48"
Internal gear, tooth face: 5¾"
Headstock bearing on bed: 56"
Spindle bearing, dia. front: 11¼"; diameter rear: 8"

BED Bed's width across top of ways: 46½"
Depth of bed: 25¾"
Carriage length on bed: 60"
Width of carriage bridge: 20"
Length of cross slide bearing: 29"

FEEDS Feeds and threads: 56; range of feeds, normal: .0045" to .504"; optional: .009" to 1"
Lead screw dia.: 3½"; range of threads: ½ to 56
Lead screw, double thread: 1" lead

TAILSTOCK Tailstock spindle dia.: 7"; length: 36"; travel: 20"
Tailstock length on bed: 32"

MOTORS Main Drive HP: 30, 40, 50 or 60
Carriage traverse: 3 HP, RPM 1200
Headstock lubrication: ½ HP, RPM 1800

WEIGHT Weight of lathe 20' bed: 44,000 lbs.
Each additional 5' length: 4,500 lbs.
Cubic contents 20' bed: 1,300 cf

Also available in 54" and 60" lathes. All can be adapted for your special purposes.

Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Sales Service Mch. Tool Co., 2363 University Ave., St. Paul, Minn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Wales-Strippit Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

PRESSES, Straightening

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar Co., A. B., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works (Hydraulic), 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILING MACHINES

Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Mchry. Co., Inc. (and Affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 620 E. Vienna Ave., Milwaukee, Wis.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., Logansport, Ind.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
Sier Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sier Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Bowser, Inc., 1365 E. Creighton Ave., Fort Wayne, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Sier Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Tuthill Pump Co., 939 E. 95th St., Chicago 19, Ill.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Vacuum

Leiman, Inc., 156 Christie St., Newark, N. J.

(Continued on page 378)





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NOW . . . a 60-ton power press with all the famous Press-Rite features! Available in either flywheel or back-geared models, the Press-Rite No. 60 is designed with extra frame rigidity to practically eliminate deflection on heavy drawing and blanking operations. The large die space simplifies handling of bulky dies . . . cuts set-up time. The Press-Rite Airflex Clutch and Brake System delivers full stroke power through every operating cycle . . . provides positive, instantaneous braking action. High production . . . low maintenance . . . long dependable operation—these advantages make the Press-Rite No. 60 a profitable addition to your production line.

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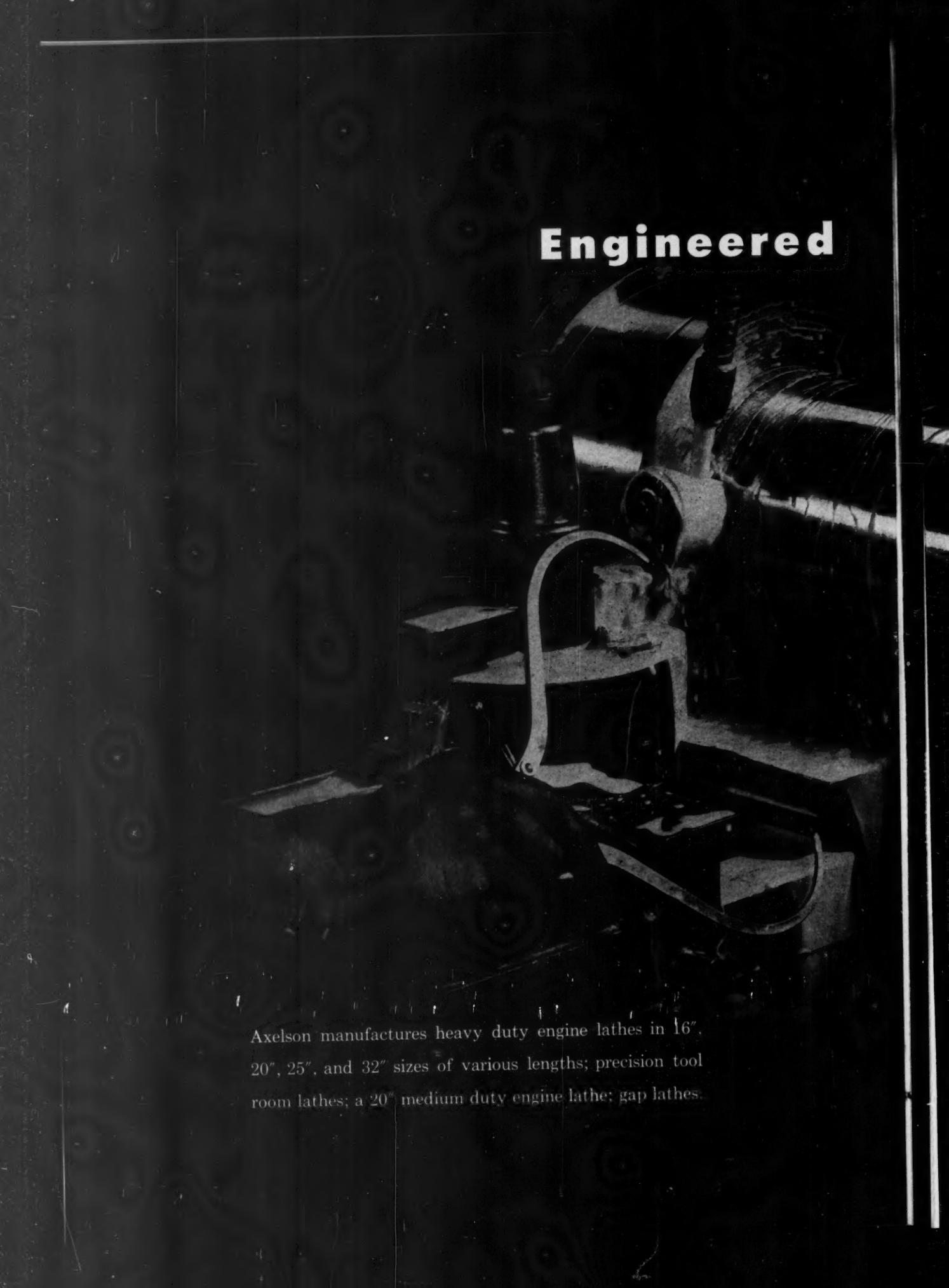


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for the tough jobs, too!

From the heaviest roughing cut down to the finest precision cut Axelson lathes are designed and manufactured to give precise, accurate service. Critical dimensions "stay put" because each Axelson lathe part is produced under strict metallurgical control. Recording pyrometers keep continuous time and temperature records of hardening, tempering and normalizing operations on gears, spindles, shafts, lead screws, etc. Quality built, Axelson lathes are capable of delivering dependable, accurate work under the most difficult operating conditions.



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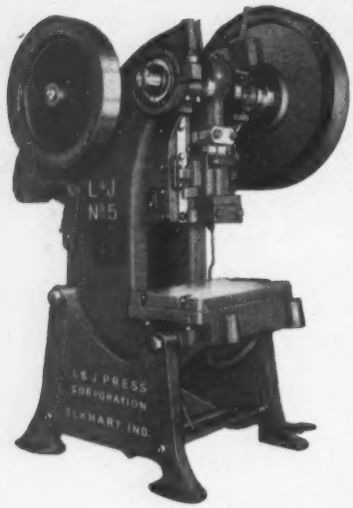
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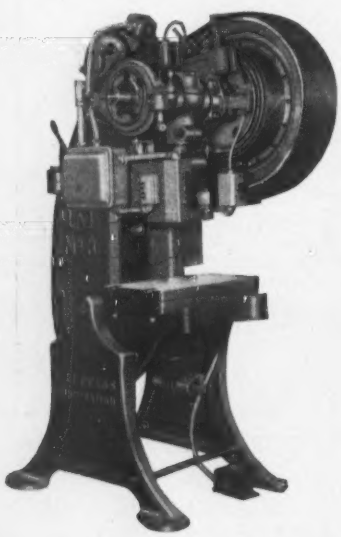
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See Dies, Sheet Metal, Etc.

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Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Wales-Strippit Corp., North Tonawanda, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

PYROMETERS

Bristol Co., Platts Mills, Waterbury, Conn.

RACKS, Gear Cut

Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

REAMER HOLDERS

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

Atrax Co., Newington, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stelliite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Madison Mfg. Co., Muskegon Heights, Mich.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

REAMERS, Taper Pin

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

REAMING MACHINES

Greaves Machine Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

RECORDING INSTRUMENTS for Counting

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

RECORDING INSTRUMENTS for Electricity

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

RECORDING INSTRUMENTS for Pressure

Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Speed

Bristol Co., Platts Mills, Waterbury, Conn.

RECORDING INSTRUMENTS for Temperature

Bristol Co., Platts Mills, Waterbury, Conn.

REELS, Stock, Standard and Automatic

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORIES, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

Bristol Co., Platts Mills, Waterbury, Conn.
General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York, N. Y.

(Continued on page 380)

OCHSENREITHER



The Story of

"The Crow and the Pitcher"

MAKES A POINT FOR GRINDING FLUID USERS...

The Story (one of Aesop's Fables)

A long, long time ago, a terribly thirsty crow had searched miles for water before he found an old pitcher with water in it. But the water was so low he couldn't reach it. His *obvious thought* was to push the pitcher over, but just in time he realized he'd lose the water that way. So he searched until he found some pebbles and, one by one, dropped them in the pitcher until the water level rose to where he could reach it.

The Point

The *obvious thought* about grinding fluids is not always the best. When selecting a grinding fluid for a precision grinding job, some plants think first of "just a coolant"—yet, many times, "more than a coolant is needed". A case to prove the point is shown at right. A low cost soluble oil was obviously not the answer to this straight grinding oil job! True, the initial cost of the grinding oil is more than that of the water-mixture, but the benefits offset the initial cost many times over.

If you grind valves, pistons, tappets, jet engine buckets or other aircraft parts, cutting tools, gears, or other parts where higher surface finish, less heat checks, or longer wheel life are desirable, just a little extra thought before you "tip the pitcher over" may pay great dividends. Investigate Stuart's Precision Grinding Oils. Fill in and mail the coupon below.

Comparison
Soluble Oil vs. Grinding Oil
on Valve Grinding Operation

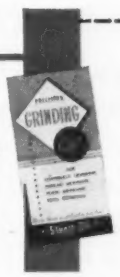
	OLD METHOD		NEW METHOD	
Grinding Fluid	Soluble Oil		SuperKool 81X Grinding Oil	
Material and Hardness	Steel Forgings Rc 30-36		Steel Forgings Rc 30-36	
Stock Removal	VALVE STEM Finish Grind .004"-.006" in 2 passes	VALVE FACE Rough Gr. .006"-.008" Finish Gr. .004"-.006" in 2 passes	VALVE STEM Finish Grind .004"-.006" in 1 pass	VALVE FACE Rough & Finish Grind in 1 pass .014"
Average Production per Wheel Dressing	350-400 pcs.	300-350 pcs.	2000 pcs.	1200 pcs.
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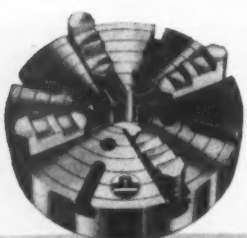
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General Electric Co., Schenectady, N. Y.
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Bethlehem Steel Co., Bethlehem, Pa.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Peck, Stow & Wilcox Co., Southington, Conn.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

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RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.

RUST PREVENTIVES

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment.

SANDERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.
Millers Falls Co., Greenfield, Mass.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.

SAW SHARPENING MACHINES

Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

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Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Earle Gear & Machine Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.

SAWING MACHINES, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Victor Saw Works, Inc., Middletown, N. Y.

SAWS, Circular Metal Cutting

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Brown & Sharpe Mfg. Co., Providence, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

(Continued on page 382)

How a carbide die outperforms a steel die by 25 to 1 for Schick, Inc.

In past six years, a Carboloy die (shown at left) produced over 62,500,000 parts with only 25 regrinds. It saved 4,375 hours of steel-die regrinding time . . . saved 900 hours of press setup time because of longer production runs. Carbide die produces over 2,500,000 pieces per grind . . . steel die, less than 100,000.



Carboloy Cemented Carbide die built for Schick, Inc., in 1946 by Lincoln Park Industries under direction of Mr. George F. Eglinton. Die is still in daily use.

You get more carbide benefits with Carboloy dies and services!

For blanking, forming, drawing and piercing dies that will stand up under terrific hour-after-hour pounding . . . always specify Carboloy Cemented Carbide.

It's quality-controlled by 29 rigid, probing tests that stem from Carboloy experience as world's largest maker of cemented carbides.

You get extra die life from Carboloy Cemented Carbide — hardest metal made by man — because extra life is built into it!

Carbide benefits

You or your die maker may order Carboloy Cemented Carbide made to your specifications in rough-finished form. You get all carbide benefits . . . and final finishing and assembly into your dies are easily done in your own toolroom, or by your die maker.

Carbide specialists

Carboloy Field Engineers are ready with on-your-job solutions to tough die problems . . . and ready to help you design new carbide applications.

Carbide training

Your key toolroom personnel can learn latest carbide techniques, become expert in finishing and servicing carbide dies at the Carboloy Customer Training School.

Carbide data

For a handy, all-inclusive guide showing how easy it is to design, use and maintain carbide dies, write for the Carboloy Die Engineering Manual, D-124.

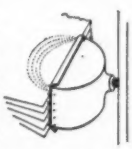
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11147 East 8 Mile Road, Detroit 32, Michigan

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- ☐ Die Engineering Manual, D-124
- ☐ Permanent Magnet Stock Catalog, PM-100
- ☐ Have a Carboloy Field Engineer call.

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Company _____

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City _____ Zone _____ State _____

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Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Union Twist Drill Co., Athol, Mass.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

SAWS, Portable Electric

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Millers Falls Co., Greenfield, Ohio.

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.

SCREW DRIVING AND NUT SETTING EQUIPMENT

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Jarvis, Charles L., Co., Middletown, Conn.
Keller Tool Co., Grand Haven, Mich.

SCREW MACHINE TOOLS AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINE WORK

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Eastern Mch. Screw Corp., New Haven, Conn.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Brown & Sharpe Mfg. Co., Providence, R. I.
Con Automatic Mch. Co., Inc., Windsor, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW MACHINES, Hand

See also Lathes, Turret.

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bristol Co., Platts Mills, Waterbury, Conn.
Chicago Screw Co., Bellwood, Ill.
National Acme Co., 170 E. 131st St., Cleveland Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.
Set Screw & Mfg. Co., 35 Main St., Bartlett, Ill.
Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-Tapping, Drive

Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SCREWS, Thumb

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

SEALS AND RETAINERS, Oil or Grease

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio.
Miles Machinery Co., Box 770, Saginaw, Mich.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, Ill.
National Acme Co., 170 E. 131st St., Cleveland Ohio.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
De Laval Separator Co., Poughkeepsie, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAFTS

National Forge & Ordnance Co., Irvine, Warren County, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAFTS, Flexible

Jarvis, Chas. L., Co., Middletown, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

SHAFTS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.

SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa.
Cumberland Steel Co., Cumberland, Md.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS

American Tool Works Co., Pearl and Eggleston Ave., Cincinnati, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hendey Machine Co., Inc., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Morton Mfg. Co., Muskegon Heights, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Orban, Kurt, Co., Inc., 205 E. 42nd St., New York 17, N. Y.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

(Continued on page 384)

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SHAPERS, Vertical

British Industries Corp., International Mchry. Div., 164 Duane St., New York, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPES, Cold Drawn Steel

Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

SHAPES, Structural

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg., Lake City, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J
Yoder Co, 550 Walworth Ave., Cleveland, Ohio.



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Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

SHEARS, Squaring

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Simonds Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass.

SHEET METALS

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Corp., Bethlehem, Pa.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Corp., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Lobdell United Co., 2000 "G" St., Wilmington 99, Del.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

(Continued on page 386)



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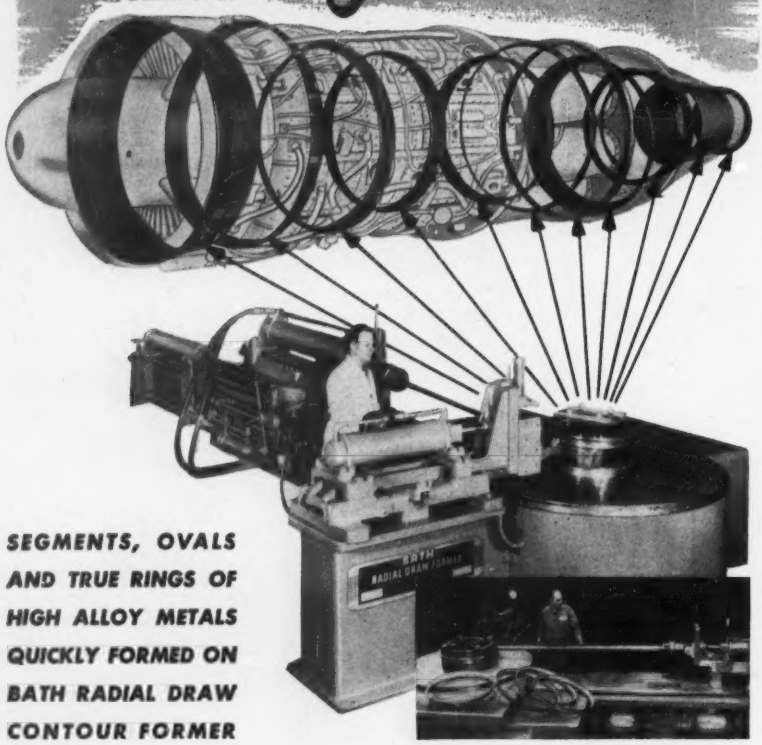
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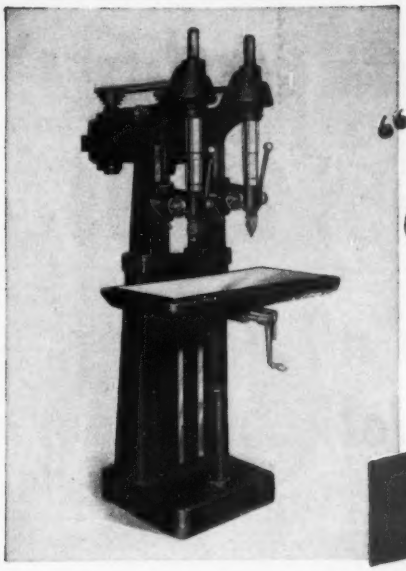
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National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
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Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engineering Co., Chambersburg, Pa.
Colonial Broach Co., Detroit 13, Mich.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Douglas Tool Co., 2300 E. Nine Mile Rd., Hazel Park, Mich.
Earle Gear & Mch. Co., 4707 Stenton Ave., Wayne Junction, Philadelphia 44, Pa.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
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Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Mathewson Machine Works, Inc., 28 Hancock St., Quincy 71, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morgan Engrg. Co., Alliance, Ohio.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4 Wis.
OK Tool Co., Milford, N. H.
Pioneer Engrg. & Mfg. Co., 19679 John R St. Detroit, Mich.
Pioneer Pump & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

(Continued on page 390)



"Buffalo" BUILDS the DRILL that can cut your

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- FATIGUE

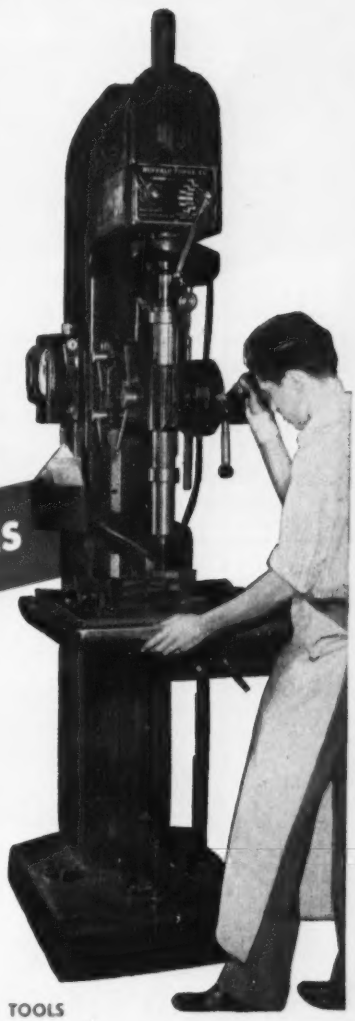
. . . IN THE TOOL ROOM . . . OR "ON THE LINE"



You can pick a "Buffalo" Drill matched to the exact drilling, tapping or reaming jobs you do, and get a real saving in time and costs. At left is one example—the "Buffalo" No. 14 High Speed Sensitive Drill for accurate work on precision parts using drills up to ½".

Seven other models, up to 2" capacity in cast iron, are available. All controls are placed for almost effortless operation. Speed changes and table or head raising or lowering are all done rapidly.

For JOB DRILLING or "MARATHON" RUNS



Whether you need a machine for odd-job drilling, tool room work or long production runs, "Buffalo" builds it. At right is the famous "RPMster," the drill with 1001 speeds instantly changed. At left is the big, rugged "22" that's as easy to handle as small sensitive drills. As a first step towards getting *your* drilling costs down, why not write us for recommendations on your problem? Thousands of plants have benefitted by doing this.

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"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

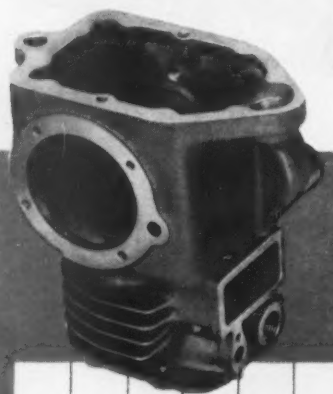
440 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

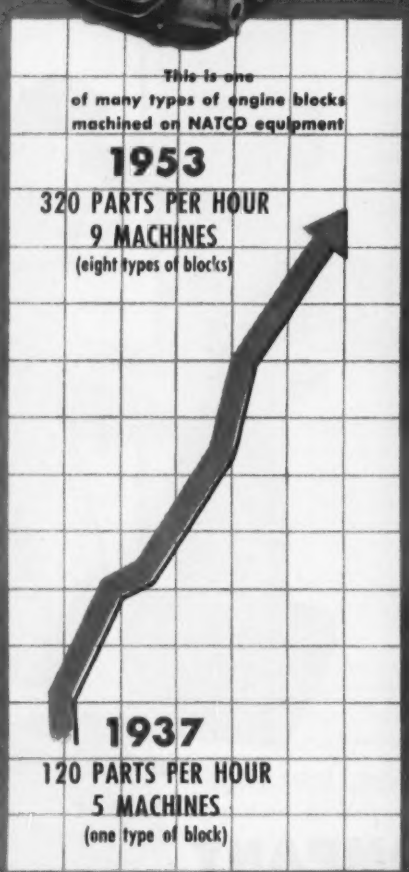
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well known manufacturer produces record MILLION ENGINES in 1952

9 NATCO machines produce all holes in 320 engine blocks per hour



This is one of many types of engine blocks machined on NATCO equipment



Here are the facts...

Back in 1937 a well known engine manufacturer installed four large NATCO Station Machines and a tapper. These machines performed a total of 170 operations on 120 engine blocks each hour. Modifications increased production to 140 blocks per hour on any of eight types of engines.

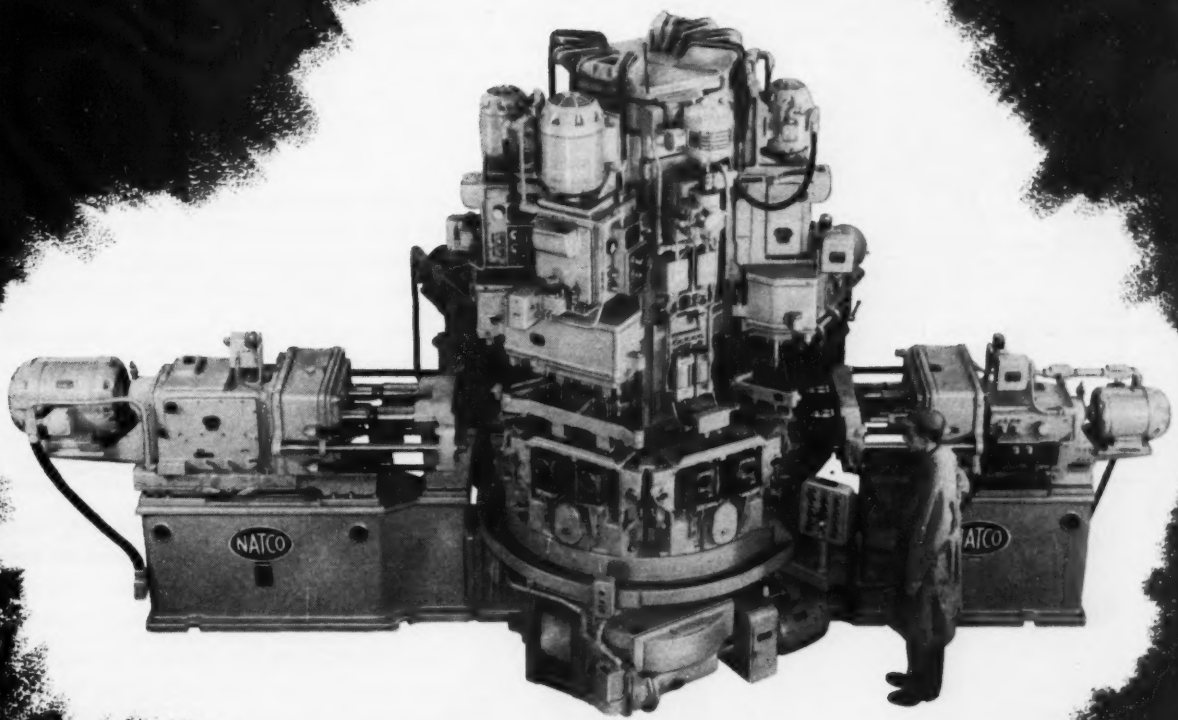
In 1951 this engine manufacturer added four new NATCO Station Machines to their production lines. These new machines performed the same operations on 180 engine blocks per hour on any of eight different blocks.

Here again is another example of a NATCO engineered production installation proving successful and additional equipment being added to further increase production and to lower costs.

LET NATCO ENGINEERS SOLVE YOUR "HOLE" PROBLEM

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for quality and quantity production



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Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.
Zagar Tool Co., 24000 Lakeland Blvd., Cleveland 23, Ohio.

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Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General El ctric Co., Schenectady, N. Y.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Pope Mchry. Corp., Haverill, Mass.
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SPINNING LATHES

See Chucking Machines.

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Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
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Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

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Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

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STAMPINGS, Sheet Metal

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Dayton Rogers Mfg. Co., 2824 13th Ave., S., Minneapolis 7, Minn.
Laminated Shim Co., Inc., Glenbrook, Conn.
Republic Steel Corp., Niles Steel Products Div., Republic Bldg., Cleveland 1, Ohio.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

STAMPS, Steel and Marking Dies

Hoggson & Pettis Mfg. Co., 149 Brewery St., New Haven, Conn.

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Alleghey Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Frasse, Peter A., & Co., Inc., 17 Grand St., New York 13, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
U. S. Steel Supply Div., U. S. Steel Co., 208 S. LaSalle St., Chicago 4, Ill.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

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American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Clev land, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
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Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.

(Continued on page 392)

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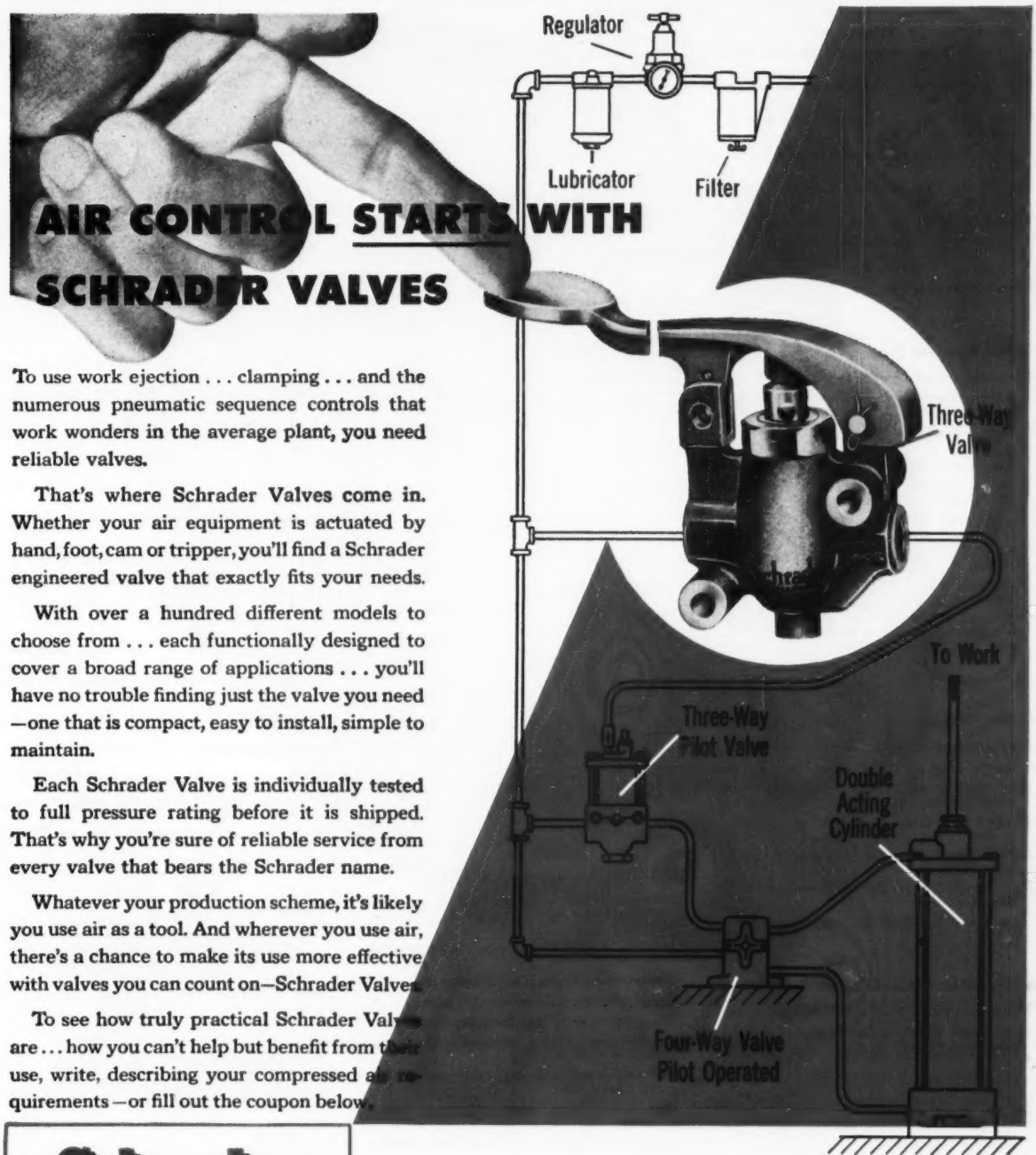
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Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

Timken Roller Bearing Co., Canton, Ohio.

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Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

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Bethlehem Steel Co., Bethlehem, Pa.

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Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

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Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Carpenter Steel Co., Reading, Pa.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

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Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

STEEL ALLOYS

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STEEL BARS—See Bars, Steel.

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Starrett, The L. S., Co., Athol, Mass.

Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.

Card, S. W., Mfg. Co., Div. Union Twist Drill Co, Mansfield, Mass.

Greenfield Tap & Die Corp., Greenfield, Mass.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

Pratt & Whitney, West Hartford 1, Conn.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

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Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.

Norton Co., 1 New Bond St., Worcester 6, Mass.

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Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Chambersburg Engrg. Co., Chambersburg, Pa.

Colonial Broach Co., Detroit 13, Mich.

Consolidated Mch. Tool Corp., Rochester, N. Y.

Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.

Springfield Mch. Tool Co., Springfield, Ohio.

Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

STRIPPING UNITS, Die

Wales-Strippit Corp., North Tonawanda, N. Y.

STUD SETTERS

Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.

Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES

Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

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Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.

Torrington Co., Torrington, Conn.

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General Electric Co., Schenectady, N. Y.

Micro Switch Div., Minneapolis-Honeywell Regulator Co., Freeport, Ill.

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

Westinghouse Electric Corp., Pittsburgh 30, Pa.

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Bristol Co., Platts Falls, Waterbury, Conn.

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

TAPER PINS, Standard

Chicago Screw Co., Bellwood, Ill.

Morse Twist Drill & Mch. Co., New Bedford, Conn.

Pratt & Whitney, West Hartford 1, Conn.

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Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.

McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.

Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill

TAPPING ATTACHMENTS AND DEVICES

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.

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Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.

Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.

Homestrand, Inc., Larchmont, N. Y.

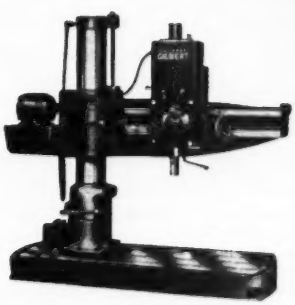
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(Continued on page 394)

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Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.

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Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

Jarvis, Chas. L., Co., Middletown, Conn.

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Kingsbury Mch. Tool Corp., Keene, N. H.

Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.

Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.

Moline Tool Co., 102 20th St., Moline, Ill.

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

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National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

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Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.

Continental Tool Works, Div. Ex-Cell-O Corp., Detroit 32, Mich.

Detroit Tap & Tool Co., Detroit, Mich.

Geometric Tool Co., Westville Station, New Haven 15, Conn.

Greenfield Tap & Die Corp., Greenfield, Mass.

Landis Mch. Co. Solid Adjustable), Waynesboro, Pa.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

Pratt & Whitney, West Hartford 1, Conn.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.

Winter Bros. Co., Rochester, Mich.

Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn.

Landis Mch. Co., Waynesboro, Pa.

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

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Eastern Mch. Screw Corp., New Haven, Conn.

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Hirschman, Carl, Co., 30 Park Ave., Manhasset, N. Y.

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Landis Mch. Co., Waynesboro, Pa.

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Pratt & Whitney, West Hartford 1, Conn.

Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Detroit Tap & Tool Co., Detroit, Mich.

Eastern Mch. Screw Corp., New Haven, Conn.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Geometric Tool Co., Westville Station, New Haven 15, Conn.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Landis Mch. Co., Waynesboro, Pa.

Pratt & Whitney, West Hartford 1, Conn.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Taft-Peirce Mfg. Co., Woonsocket, R. I.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

THREAD GAGES

See Gages, Thread.

THREAD GRINDING MACHINES

See Grinding Machines, Thread.

THREAD MILLING MACHINES

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.

Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.

Pratt & Whitney, West Hartford 1, Conn.

Precise Products Corp., 1328-30 Clark St., Racine, Wis.

Sheffield Corp., 721 Springfield, Dayton, Ohio.

Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING MACHINES

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.

Hirschman, Carl, Co., 30 Park Ave., Manhassett, N. Y.

Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

Salvo Tool & Engineering Co., 26441 Gratiot Ave., Roseville, Mich.

V & O Press Co., Div., Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa.

Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

U. S. Steel Corp. (Carnegie-Illinois Steel Corp. Div. Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Carpenter Steel Co., Reading, Pa.

Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

Vanadium Alloys Steel Co., Latrobe, Pa.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

TOOL BITS, Special Alloy

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

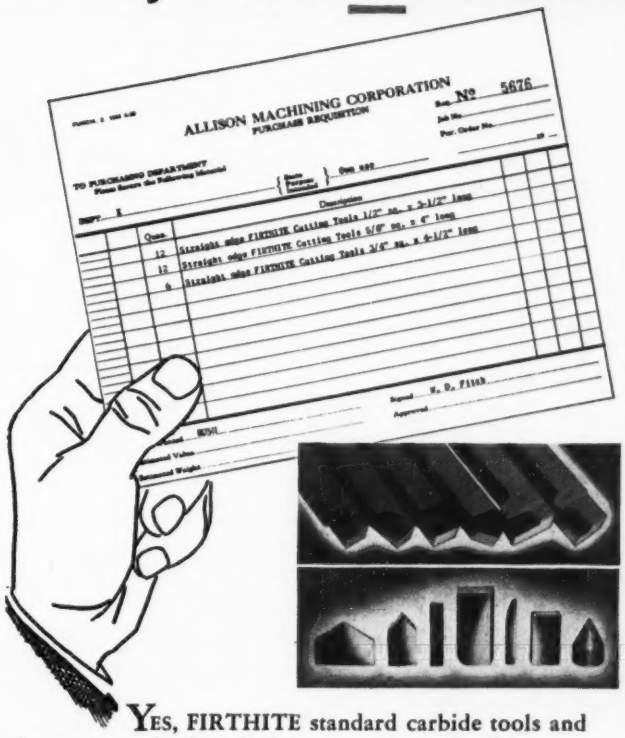
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

(Continued on page 396)

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Dawson Tool & Abrasive, Inc.

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Industrial Sales & Service, Inc.

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A. V. Wiggins Company

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Fochtman Motor Company

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Precision Tool Sales

WICHITA, KANSAS
Midwestern Tool & Supply Co.
Ernst Machinery Company

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Sterling Sales, Inc.

YORK, PA.
York Machinery & Supply Co.

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Dunlap Welding & Supply Co.

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R-280

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Kennametal, Inc., Latrobe, Pa.

Vanadium Alloys Steel Co., Latrobe, Pa.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planing Tools.

TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Lovejoy Tool Co., Inc., Springfield, Vt.

Maxwell Co., 420 Broadway, Bedford, Ohio.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.

OK Tool Co., Milford, N. H.

Portage Double Quick Tool Co., 1036 Sweitzer Ave., Akron 11, Ohio.

R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mach.

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Ames, B. C., Co., Waltham 54, Mass.

Brown & Sharpe Mfg. Co., Providence, R. I.

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

Starrett, The L. S., Co., Athol, Mass.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Bethlehem Steel Co., Bethlehem, Pa.

Carpenter Steel Co., Reading, Pa.

Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Atrax Co., Newington, Conn.

Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Colonial Broach Co., Detroit 13, Mich.

Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.

Kennametal, Inc., Latrobe, Pa.

Maxwell Co., 420 Broadway, Bedford, Ohio.

McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.

Metal Carbides Corp., Youngstown, Ohio.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

Precise Products Corp., 1328-30 Clark St., Racine, Wis.

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

Union Twist Drill Co., Athol, Mass.

Wesson Metal Corp., Lexington, Ky.

Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

Kennametal, Inc., Latrobe, Pa.

Lovejoy Tool Co., Inc., Springfield, Vt.

Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.

OK Tool Co., Milford, N. H.

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TRANSFER MACHINES, Automatic

Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.

Colonial Broach Co., Detroit 13, Mich.

Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.

Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.

Reliance Elec. & Engrg. Co., Collinwood Station, 1088 Ivanhoe Rd., Cleveland, Ohio.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.

Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y.

Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.

Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

Titeflex, Inc., 500 Frelinghuysen Ave., Newark 5, N. J.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

Bethlehem Steel Co., Bethlehem, Pa.

Carpenter Steel Co., Reading, Pa.

Frasse, Peter A., & Co., Inc. (Seamless), 17 Grand St., New York 13, N. Y.

Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.

Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

Solar Steel Corp., Union Commerce Bldg., Cleveland, Ohio.

Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

Timken Roller Bearing Co., Canton, Ohio.

U. S. Steel Corp., National Tube Co. Div., 436 7th Ave., Pittsburgh, Pa.

TWIST DRILLS

See Drills, Twist.

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

VALVE CONTROLS

Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

VALVES, Air

Bellows Co., 230 W. Market St., Akron, Ohio.

Hanna Engineering Works, 1752 Elston Ave., Chicago, Ill.

Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.

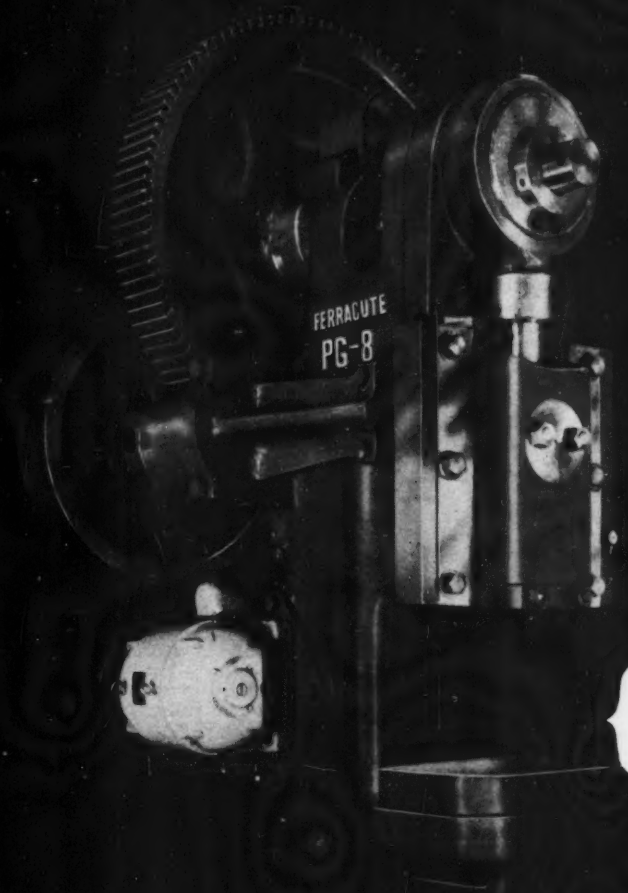
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

(Continued on page 398)

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Barnes, John S., Corp., Rockford, Ill.

Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.

Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.

Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.

Logansport Machine Co., Inc., Logansport, Ind.

Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.

Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

VIBRATION INSULATION

American Felt Co, Glenville, Conn.

VISES, Machine

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Brown & Sharpe Mfg. Co., Providence, R. I.

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.

Fenn Mfg. Co., Hartford, Conn.

Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

Hendey Machine Co., Inc., Torrington, Conn.

Homestrand, Inc., Larchmont, N. Y.

Logansport Machine Co., Inc., Logansport, Ind.

Martin, J. E. Mch. Works, 548 W. State St., Springfield, Ohio.

Neise, Karl A., Dept. M, 381 Fourth Ave., New York 16, N. Y.

Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.

Skinner Chuck Co., 344 Church St., New Britain, Conn.

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

Universal Engineering Co., Frankenmuth 2, Mich.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

VISES, Planer and Shaper

Brown & Sharpe Mfg. Co., Providence, R. I.

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.

Martin, J. E. Mch. Works, 548 W. State St., Springfield, Ohio.

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

Skinner Chuck Co., 344 Church St., New Britain, Conn.

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VISES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS

Bristol Co., Platts Mills, Waterbury, Conn.

General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WASHERS, Spring

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Air Reduction Sales Co., 60 E. 42nd St., New York, N. Y.

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.

Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.

General Electric Co., Schenectady, N. Y.

Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

Westinghouse Electric Corp., Pittsbugh 30, Pa.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

American Electric Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.

Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.

WELDING POSITIONER

duMont Corp., Greenfield, Mass.

WELDMENTS

Mahon, R. C., Co., Detroit 34, Mich.

Mathewson Machine Works, 28 Hancock St., Quincy 71, Mass.

Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIRE

American Steel & Wire Co., Div. U.S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.

Bethlehem Steel Co., Bethlehem, Pa.

Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.

Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.

U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY

Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.

National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.

Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.

Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.

Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.

Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.

Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Cleco Div., Reed Roller Bit Co. (Impact, Pneumatic), 5125 Clinton Ave., Houston 20, Tex.

Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Detachable Socket

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

WRENCHES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Peck, Stow & Wilcox Co., Southington, Conn.

WRENCHES, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

WRENCHES, Tap

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.

Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.

Greenfield Tap & Die Corp., Greenfield, Mass.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

Pratt & Whitney, West Hartford, Conn.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

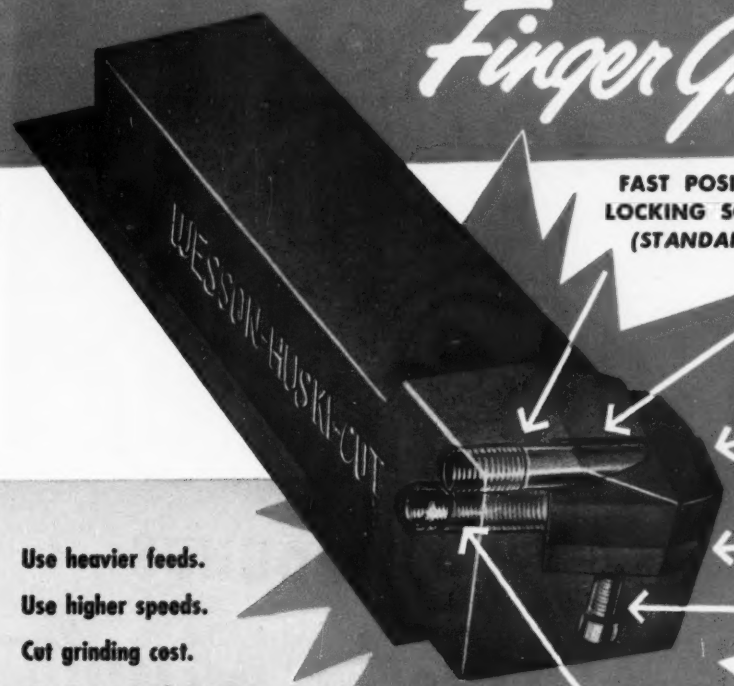
Sturtevant, P. A., Co., Addison, Ill.

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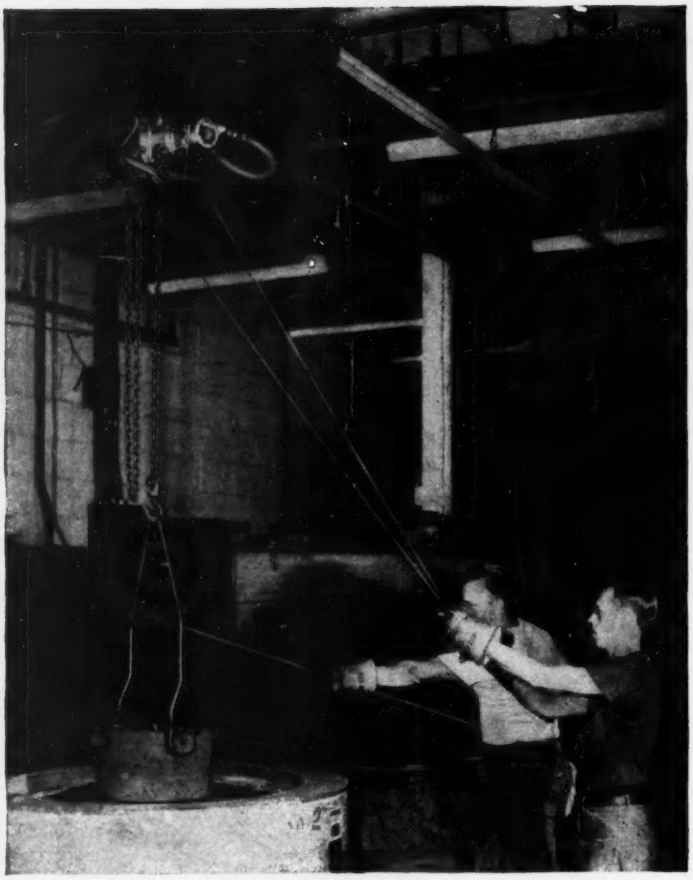
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LIFTS 1000 POUNDS at 20 feet a minute

. . . or 500 pounds at 42 feet a minute

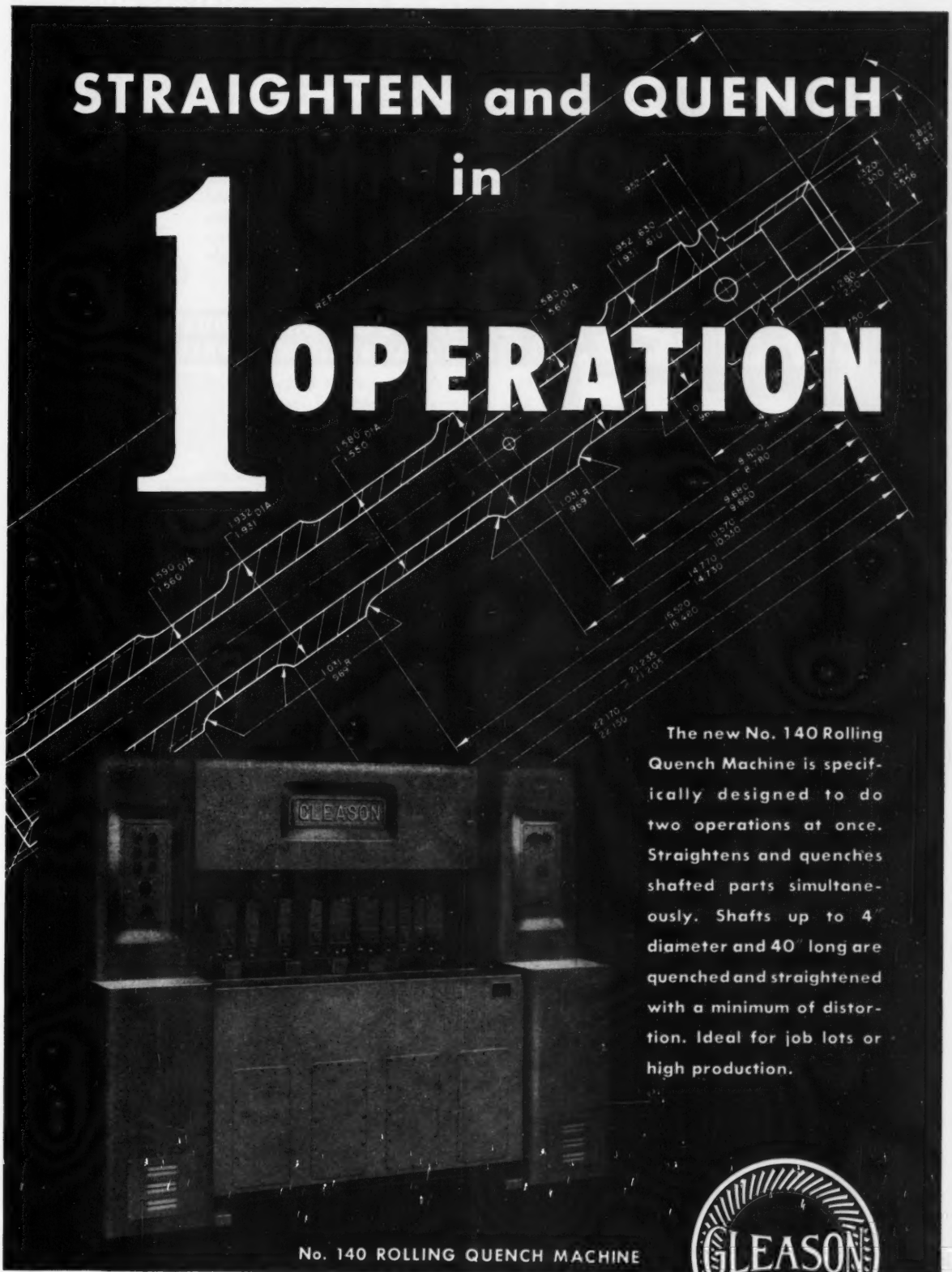
- This latest CP AIR HOIST — with variable speed, rotary vane air motor — spots loads accurately, quickly; sets them down gently.
- New design, trouble-free throttle valve provides sensitive control from an almost imperceptible creep to full speed.
- Air motor cannot overheat — no shock hazard — no spark hazard — no switches to maintain.
- Self-locking worm gear provides automatic brake — no brake bands to adjust or replace.
- Weighing only 57 pounds, the CP AIR HOIST can readily be carried by millwright to any location.
- Furnished in 300, 500, 700, and 1000 pound capacities.

Chicago Pneumatic Tool Company,
8 East 44th St., New York 17, N. Y.

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STRAIGHTEN and QUENCH in 1 OPERATION



The new No. 140 Rolling Quench Machine is specifically designed to do two operations at once. Straightens and quenches shafted parts simultaneously. Shafts up to 4" diameter and 40" long are quenched and straightened with a minimum of distortion. Ideal for job lots or high production.

No. 140 ROLLING QUENCH MACHINE

GLEASON WORKS

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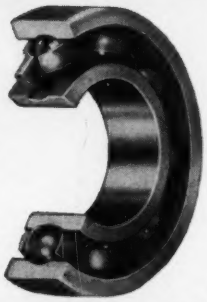
GLEASON

NICE Announces New Lines!

PRODUCT DESIGNERS will be interested in these new "cost saving" additions to the NICE Line. FOR COMPLETE INFORMATION WRITE FOR CATALOG NO. 150.

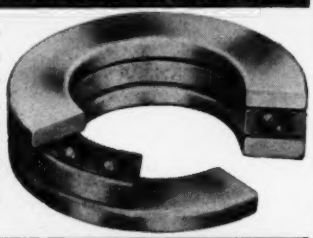
"C" SERIES GROUND RADIAL BEARINGS
SOLID RACE TYPE WITH BALL RETAINER

The new NICE "C" series are precision radial bearings made in inch dimensions which correspond to established light duty inch standard sizes. Produced with ground and polished race ways and assembled with chrome alloy balls, they are designed for light duty radial, thrust or combined load applications and speeds in the neighborhood of 5000 R.P.M. maximum. "C" series radials are available without shields, single shielded or double shielded.



"FR" SERIES GROUND THRUST BEARINGS
FLAT BALL RACES WITH BALL RETAINER

"FR" series flat race thrust bearings conform to established inch standard sizes and are recommended for light loads and speeds up to 2500 R.P.M. The ball cages are made from solid brass stock for durability and long life and the ball track surfaces are precision ground to a high finish.



7500 AND 7600 SERIES GROUND RADIAL BEARINGS
SOLID RACE TYPE WITH BALL RETAINER-LABYRINTH COMPOSITION SEALED



SERIES 7500 DOUBLE SEALED



SERIES 7600 DOUBLE SEALED

Series 7500 and 7600 bearings are recommended for applications requiring the accuracy of rotation and quiet performance of close limit precision bearings, and where a highly efficient seal is required to retain lubricant and exclude foreign materials. They are designed for medium loads and speeds in the neighborhood of 5000 R.P.M. maximum, and are made in inch standard sizes. Normally double sealed, series 7500 and 7600 bearings can be produced to order with seals on one side only or without seals.

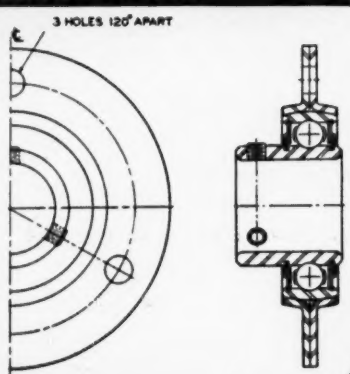


SEAL DETAIL
An oil resistant synthetic rubber coated fabric ring fits into a groove in the inner race and the recess formed by the inner and outer dust caps.

FLANGE MOUNTED SELF-ALIGNING RADIAL BEARINGS
LABYRINTH COMPOSITION SEALED-TWO LOCKING SET SCREWS



NICE series F100 flange mounted radial bearings are designed for easy application to machine frames. The self-aligning feature together with their highly efficient labyrinth composition seal (see detail above), makes them ideal for a wide variety of applications such as farm machinery, conveyors, power transmissions, blower and fan installations. They are available in popular inch shaft sizes and are recommended for medium load and speed service conditions.



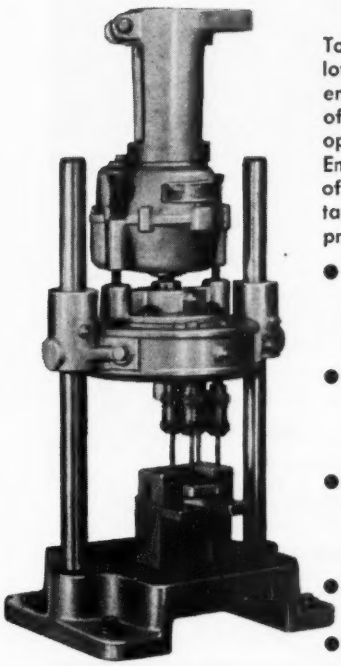
NICE

NICE BALL BEARING COMPANY
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If you tap or drill small parts

you can't afford to be without— Ettco-Emrick

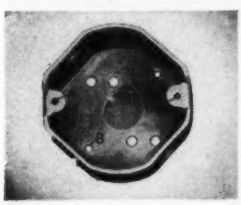
"UNIT-ENGINEERED" MULTIPLE HEADS



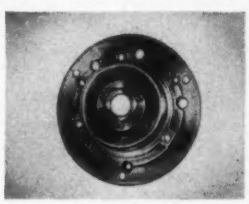
To put your small parts tapping and drilling on a low-cost, mass production basis you need specially engineered methods and equipment. Ettco's years of specialization in this field has led to the development and refinement of the Ettco-Emrick "Unit-Engineered" Multiple Head System, which is one of today's fastest, most economical methods of tapping and drilling small parts. Here's what it provides —

- *Multiple head and work holder engineered as a unit for your specific part to insure fastest handling and production with each stroke of the drill press.*
- *A selection of dozens of different standardized methods of handling a wide variety of shapes and sizes of parts and number and spacing of holes.*
- *Interchangeable tapping and drilling face plates to permit quick, easy changeovers from tapping to drilling — a patented Ettco-Emrick feature.*
- *A design that assures quick, easy installation on any make or model drill press.*
- *A limitless variety of spindle arrangements with capacities ranging from wire sizes to ⅝" in steel.*

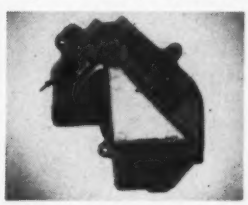
DO JOBS LIKE THESE FASTER, EASIER, AT LESS COST



Steel outlet box with 4 tapped holes. Production—12,800 tapped holes per hour with dual multiple head unit.



54 holes drilled and countersunk in one operation with a multiple head and electric indexing fixture.



Die casting with 6 holes — 3 in each of two planes — automatically positioned and tapped in one operation.

If your small parts production calls for multiple drilling, reaming, countersinking, tapping or threading — it will pay you to check with Ettco. Call in your nearest Ettco-Emrick distributor or send us a sample or drawing for recommendations and estimates.

FOR DETAILS, WRITE FOR BULLETIN No. 3



Ettco-Emrick

ETTCO TOOL CO., INC.

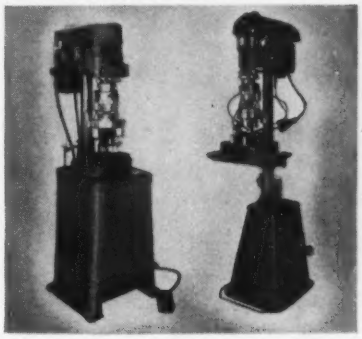
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DRILLING and TAPPING EQUIPMENT NEWS

Tapping Machines Boost Multiple Head Output



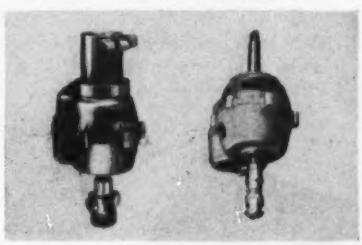
Ettco-Emrick tapping machines are designed for automatic or semi-automatic operation with multiple spindle drilling or tapping heads and single spindle tapping attachments. The No. 72A machine is foot or air-operated. The No. 74 machine is air operated and electrically controlled. *Details in Bulletins No. 72A and No. 74. Write Ettco Tool Co., 592 Johnson Avenue, Brooklyn 37, N. Y.*

Electric Indexing Fixture Has Fast, Precise Action

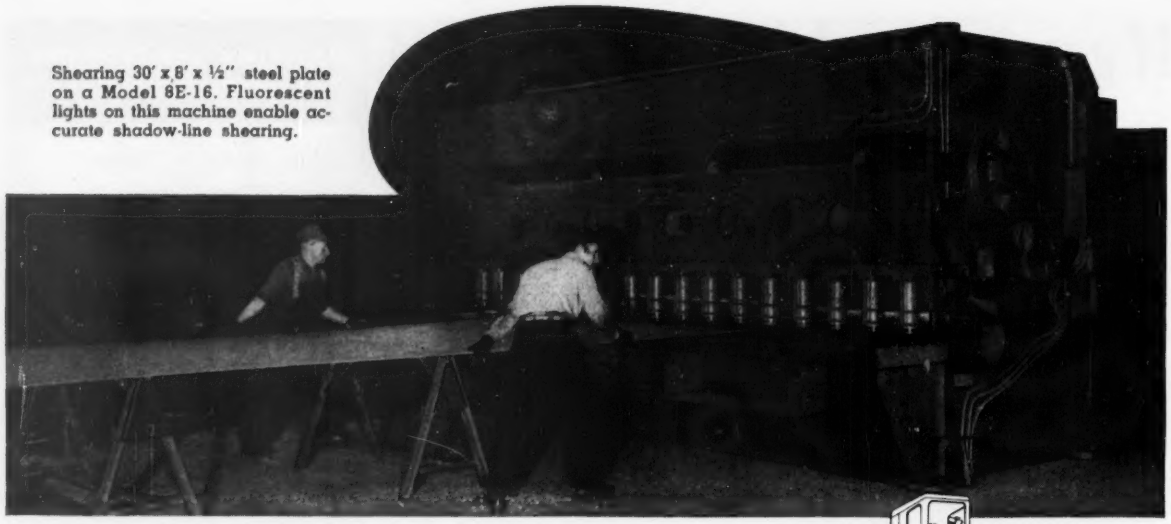


Ettco-Emrick Indexing Fixtures provide smooth, shockless, positive action. Can be used on any machine base. Synchronization of index fixture with outside machine member is electrically controlled. Utilizes interchangeable nesting plates ranging from 10" to 14" in diameter. *Details in Bulletin No. 97. Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn 37, N. Y.*

Tool Up Any Drill Press For Fast, Accurate Tapping

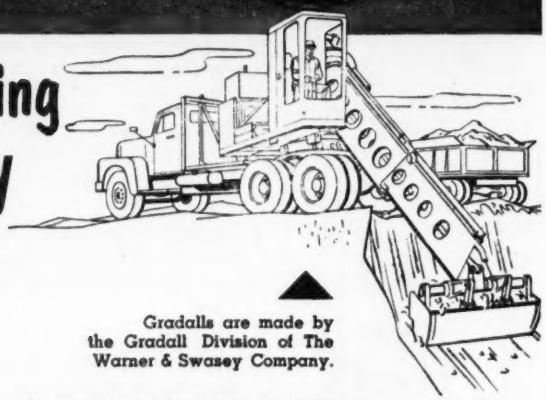


Ettco-Emrick tapping attachments can be mounted on any drill press. Newly patented friction clutch provides the delicate sensitivity needed for high speed tapping or threading. 7 different models for No. 6 to ⅝" dies and for No. 0 to 1" taps. *Details in Bulletin No. 22. Write Ettco Tool Co., 592 Johnson Ave., Brooklyn 37, N. Y.*



Shearing 30' x 8' x ½" steel plate on a Model 8E-16. Fluorescent lights on this machine enable accurate shadow-line shearing.

Smooth, Accurate Shearing Aids Warner & Swasey Gradall Production



Gradalls are made by the Gradall Division of The Warner & Swasey Company.

A Steelweld Pivoted-Blade Shear cuts all the plate used in the manufacture of Warner & Swasey's Gradall Multi-Purpose Earth-Moving Machines.

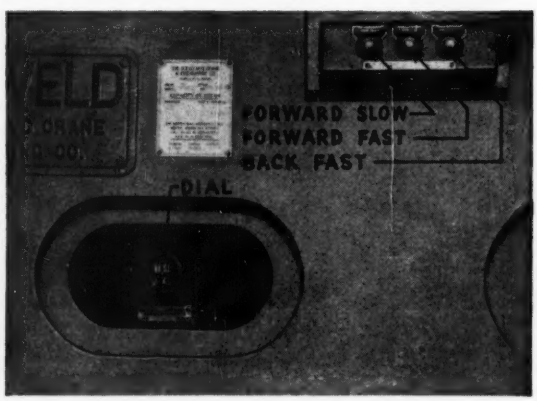
Because of the simple Micro-Set knife clearance adjustment it produces clean, sharp cuts to close tolerances in various thickness metals ranging from light gauge to ½".

The motor-driven back gauge is very popular with the operators because of the ease and speed with which it can be set. Simply by pushing buttons at the middle front of the machine and reading a dial which records to 1/64 inch, the gauge is quickly positioned exactly as required.

Steelweld Shears and Gradalls are alike in many respects: Heavy all-welded construction — Many new and revolutionary features — Entirely different in operating principle from other similar-purpose machines. Both speed the work and cut costs.

If you work with metal plate of any kind, you should have the facts on Steelweld Shears. A Steelweld representative will be glad to call on you at your convenience.

Dial and control buttons conveniently located at middle front of shear for setting motor-driven back gauge.





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CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

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STEELWELD PIVOTED BLADE SHEARS

WERNER #5 and #6

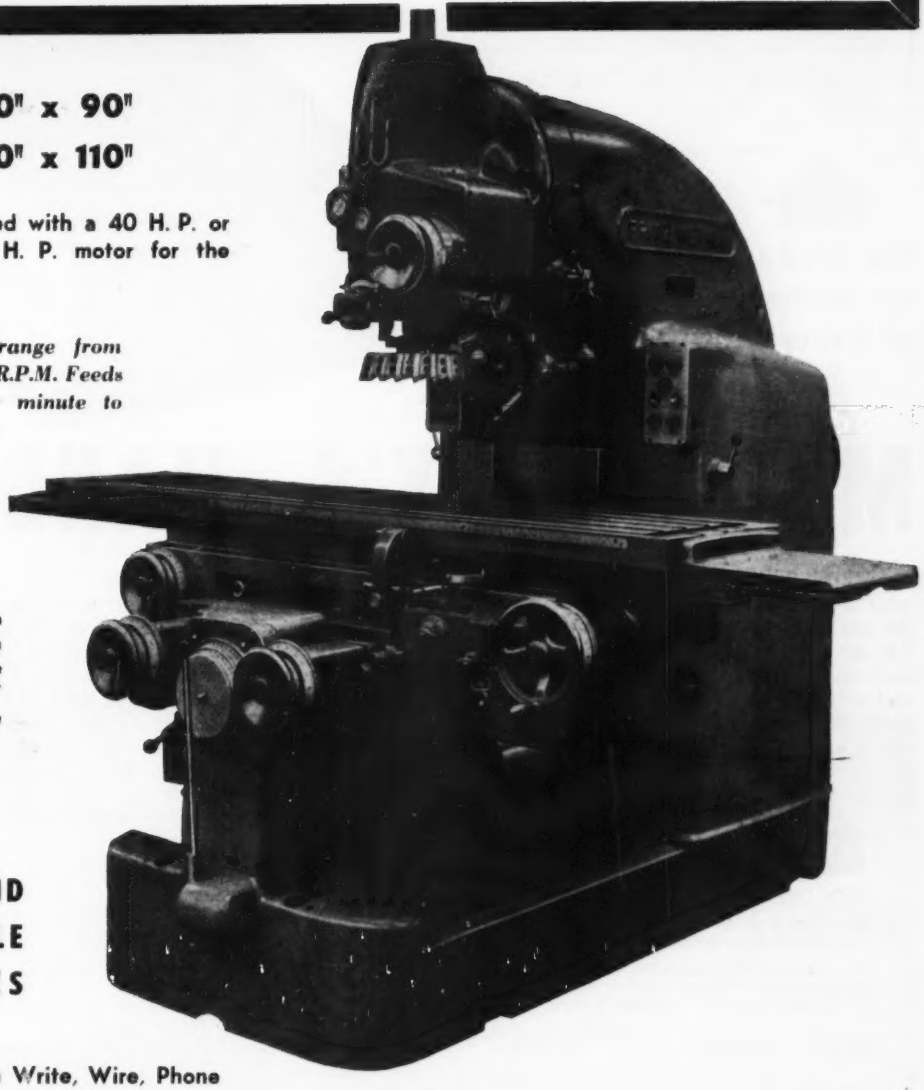
VERTICAL MILLERS

#5 Table 20" x 90"

#6 Table 20" x 110"

Both are equipped with a 40 H. P. or an optional 50 H. P. motor for the spindle drive.

Spindle speeds range from 16 R.P.M. to 1800 R.P.M. Feeds range 9/32" per minute to 80" per minute.



Werner Millers in smaller sizes from 0 to 4 with table sizes from 6"x20" up to 16"x72" are also available.

PROMPT AND REASONABLE DELIVERIES

For further information Write, Wire, Phone

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136 Main Subjects Covered in MACHINERY'S Handbook

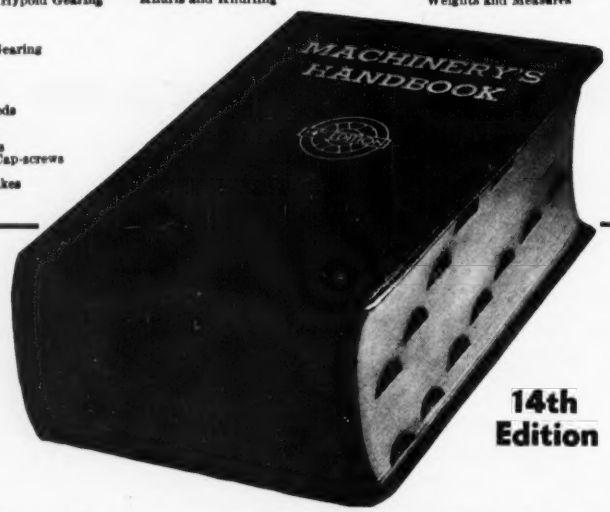
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Hyperbolic Logarithms
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Calculation of Solids
Pappus or Guldinus Rules
Contents of Cylindrical Tank at any Level
Circles and Equivalent Squares
Solution of Triangles
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Logarithms of Trigonometrical Functions
Geometrical Propositions and Problems
Standard Mathematical Signs, or Symbols
Standard Engineering Abbreviations
Standards for Drawings
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Radius of Gyration
Centrifugal Force
Flywheels
Radians
Factors of Safety

Strength of Metals and Other Common Materials
Moments of Inertia Tables
Punch and Shear Frames
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Strength of Flat Plates
Strength of Cylinders
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Thread Grinding
Thread Rolling
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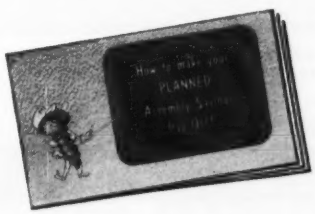
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The Original **SELF-TAPPING SCREWS**



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Wire and Ribbon Metal FORMING MACHINES

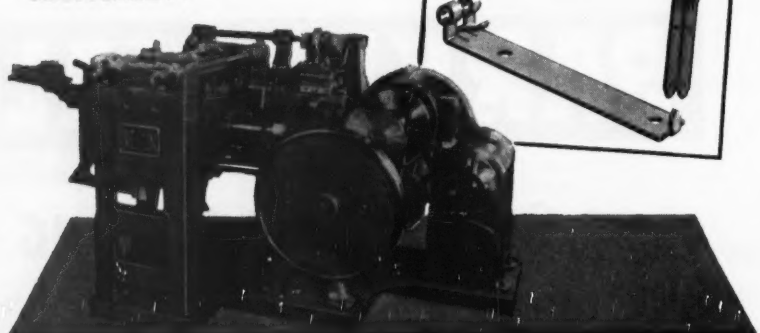
Plants from coast-to-coast are setting new production records with NILSON 4-SLIDE MACHINES . . . and experiencing tremendous economies and greatly improved quality.

Are you confronted with a keen competitive situation? Take the advice of hundreds of plant supervisors . . . install NILSON MACHINES and enjoy these economies *at once.*

NILSON combination press and 4-SLIDE forming machines take the stock directly from the coil—feed, straighten, pierce, blank, swage, stamp, coin—perform up to 5 forming operations and cut off . . . all in one quick, precise operation AUTOMATICALLY!

USING A NILSON COMBINATION PRESS AND 4-SLIDE FORMING MACHINE

Unique Balance Co., Inc. (one of the largest manufacturers of sash balance equipment), now produces 71,532 more parts out of the same amount of steel, compared to their former method. Production speeds increased from 100 to 180 pieces per minute.



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For specific recommendations, send prints or samples of your operation when requesting bulletin.

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you can make them *better, faster and at less cost*

with SHELBY SEAMLESS STEEL TUBING

BECAUSE Shelby Seamless comes to you with the basic shape and hole already made you can eliminate or greatly reduce many time and labor-consuming operations connected with boring and machining. You also save the wear and tear on expensive tools, as well as the needless waste of steel.

Another important advantage in using Shelby Seamless Tubing is that its excellent machining characteristics and uniformity speed up production and improve the quality of your output. *You can turn out parts by the millions and the last part will be as metallurgically and dimensionally accurate as the first part produced.*

Shelby Seamless Steel Tubing is available in a complete range of sizes; in different wall thicknesses; various finishes and steel analyses. Our engineers will be glad to submit recommendations based on a study of your particular requirements.



All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

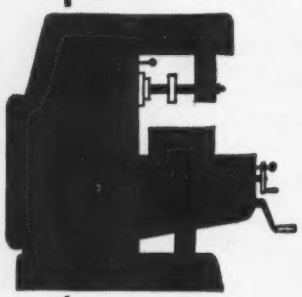
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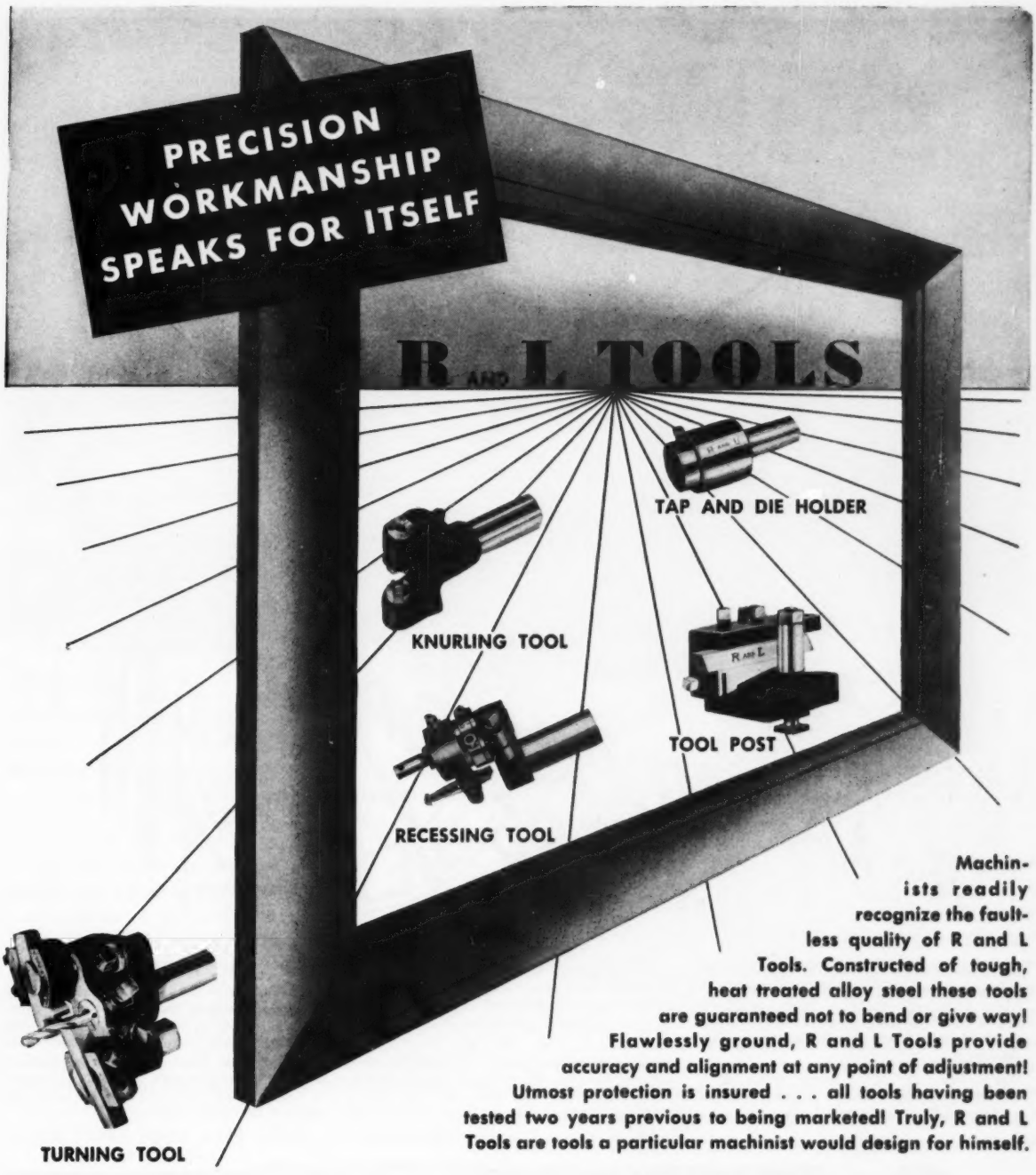


For sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

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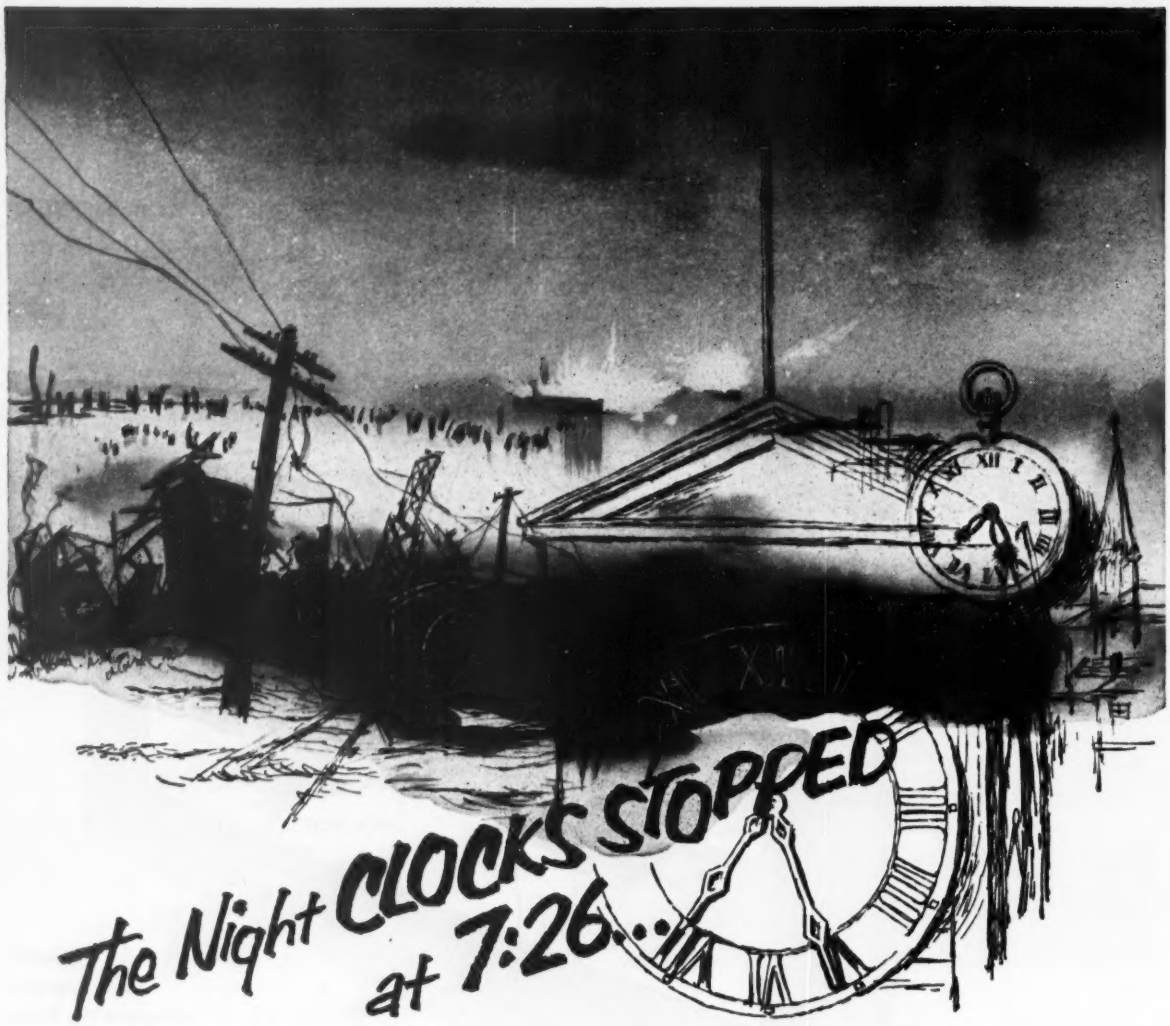
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Some 9,500 people were in South Amboy, N. J., that drizzly evening in 1950. At the waterfront, longshoremen were transferring the last of 12 freight cars of ammunition to lighters that would carry it to a waiting vessel in Raritan Bay.

But the City Hall clock never got to 7:27—and the freighter's deadly cargo never got loaded. Explosions shattered windows over a radius of 12 miles; and hundreds of people looked at their arms and legs and saw that flying daggers of glass had stabbed them.

At dawn, 312 of the injured had been counted.

★ ★ ★

Such disasters have happened many times before in America. They could happen again. And *if* they do—and *when* they do—there must be blood plasma on hand to take care of the injured. For blood saves lives!

But blood cannot be mined or manufactured. It must come from the veins of healthy men and women. Men and women who feel concern for a suffering neighbor. So give blood—now!

Whether your blood goes for Civil Defense needs, to a combat area, or to a local hospital—this priceless, painless gift will some day save an American life!

Give Blood Now

CALL YOUR RED CROSS TODAY!

National Blood Program

Business Executives!

√Check These Questions!

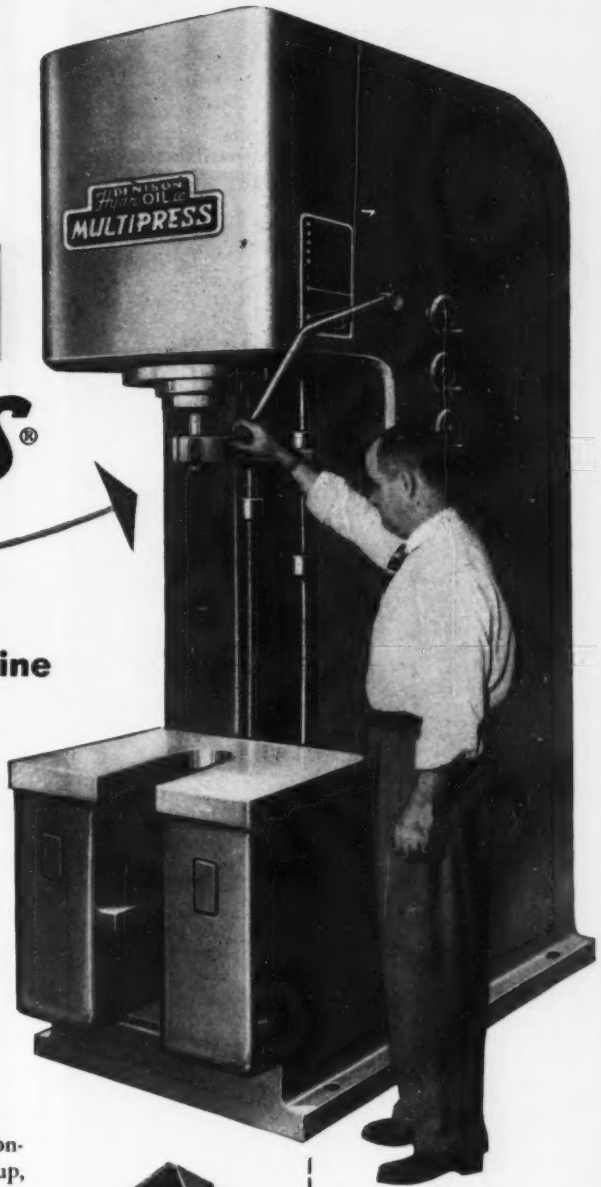
If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ☐ Have you given your employees time off to make blood donations?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Has your company given any recognition to donors?
- ☐ Have you conducted a Donor Pledge Campaign in your company?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

NOW 75-TON MULTIPRESS®

MODEL QA75



Big-job Multipress added to line

NOW — *all production-boosting Multipress advantages can be applied to jobs calling for pressures up through the 75-ton range!*

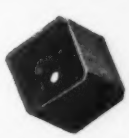
MANUAL OR AUTOMATIC CONTROL: A choice of nine control valves offers manual or automatic operation to suit any need. Dual-push button or hand-lever controls available for extra safety. Hold down and other operating sequences are easily provided.

VERSATILE RAM ACTION: The 15-inch maximum ram stroke of the new 75-ton Multipress is fully adjustable for both upper and lower limits. Pressing and approach speeds are *independently* adjustable. Continuous cycling of automatically controlled ram may be set for either distance or pressure limits.

TOUCH CONTROL: With the New Multipress servo control added, the ram starts, stops, reverses, speeds up, slows down, or applies pressure *in direct relation to every action on the hand lever.*

INDEX TABLE FEEDS AND OTHER ACCESSORIES: Six- and 12-station Multipress Index Tables can be used for fast, automatic, multiple-point feeding or assembly of parts. Many other automatic feeds, auxiliary attachments and work-speeding accessories also available.

The 75-ton Multipress has a 30-inch daylight opening (gap) . . . 34-inch work table width . . . 13-inch throat depth. Height, only 106 inches. *Write* today for full details on this versatile, big-job Multipress. *Other sizes and capacities from one to 50 tons.*



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With quick, accurate "one-shot" assembly of this 6-part metal and plastic switch component, Multipress boosted output 80% and cut scrap loss 84%.



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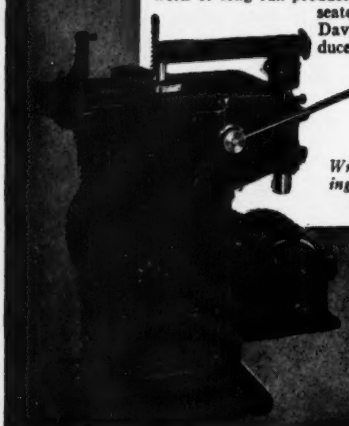
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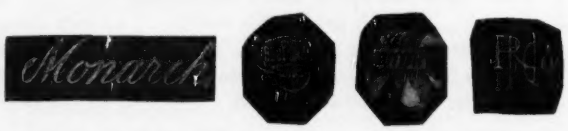
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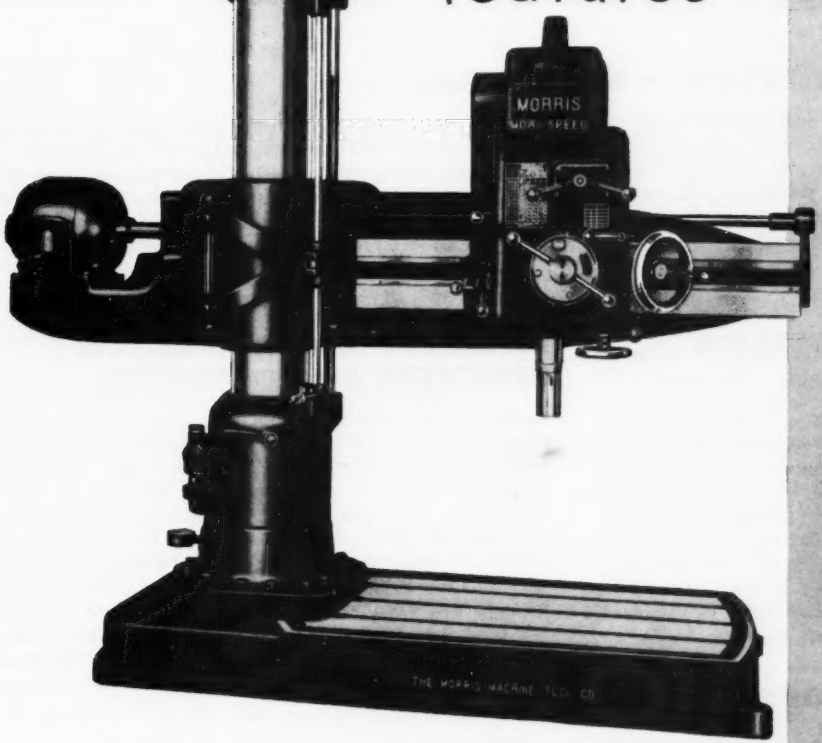
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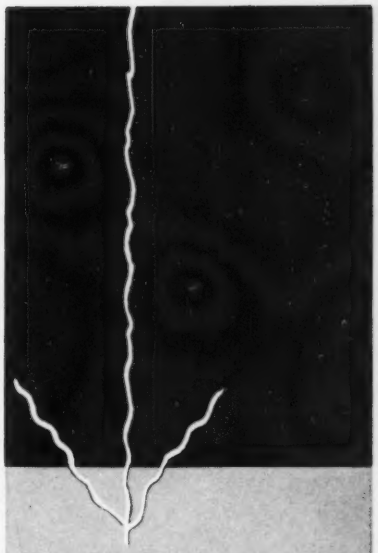
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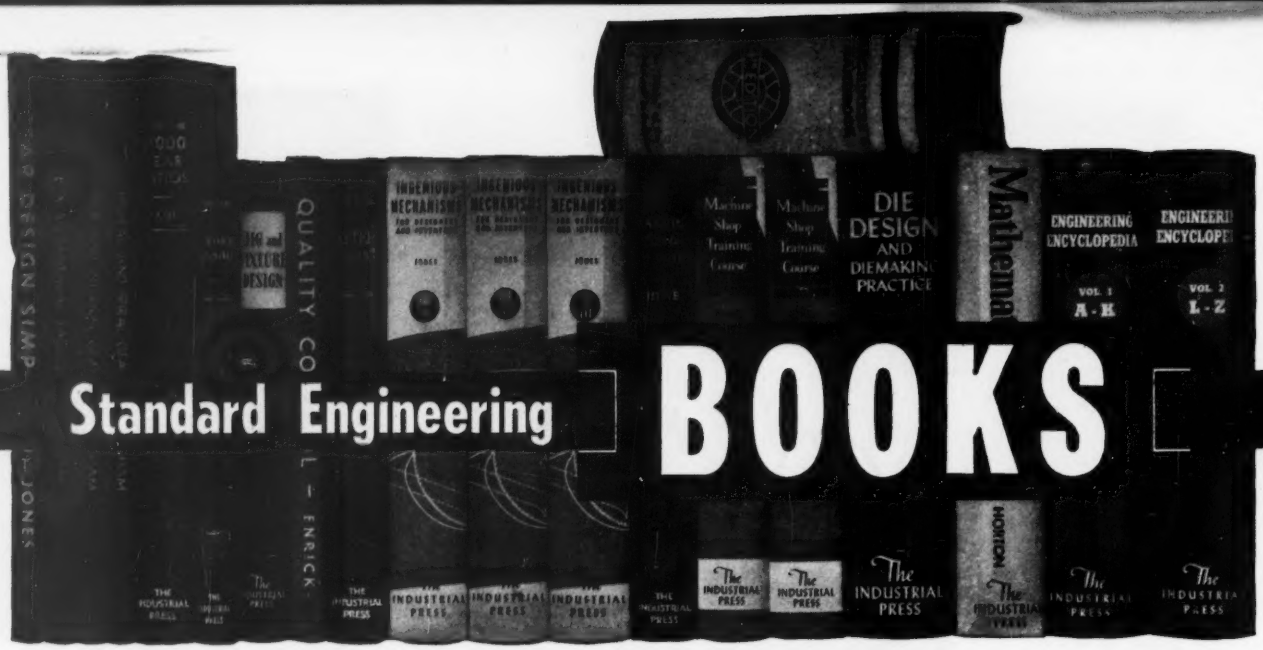
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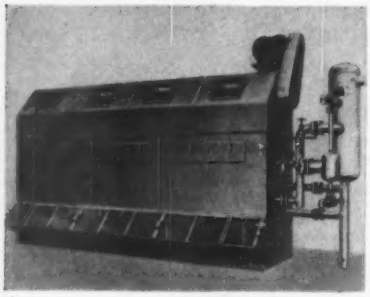
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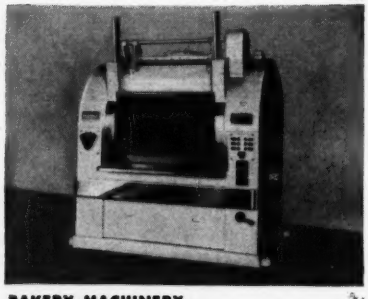


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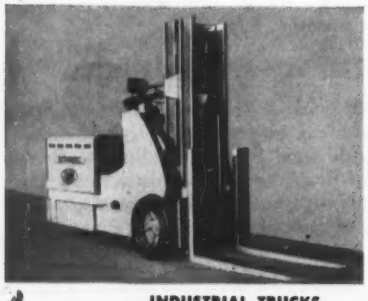
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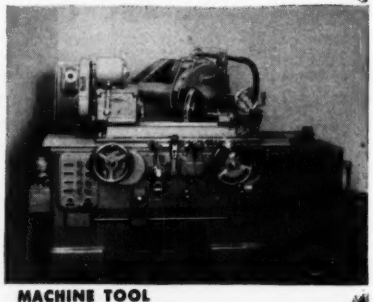
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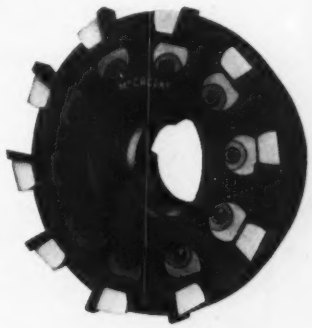
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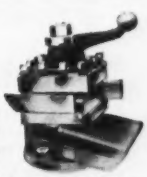
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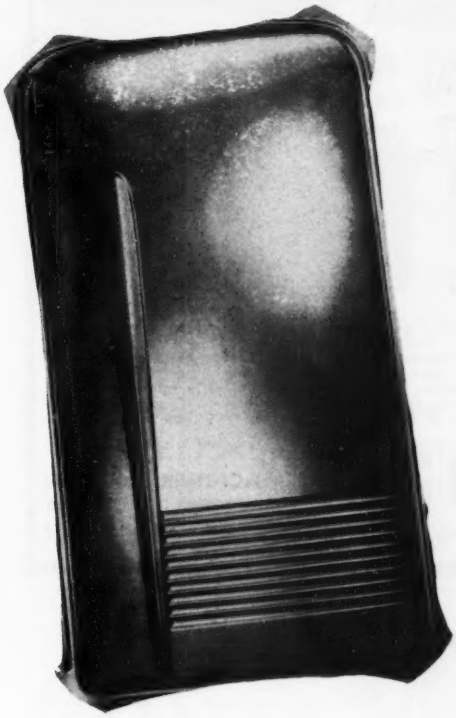
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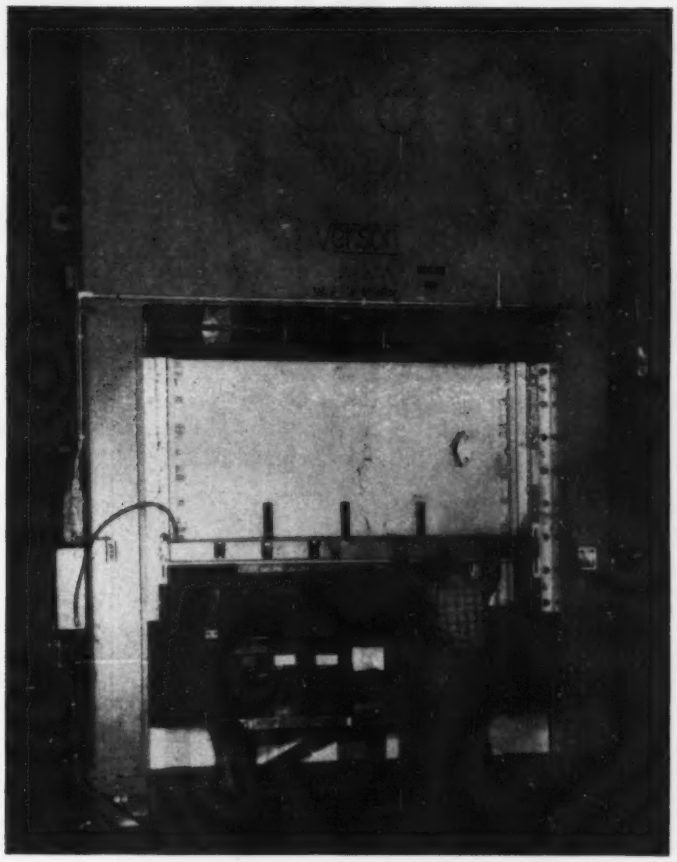
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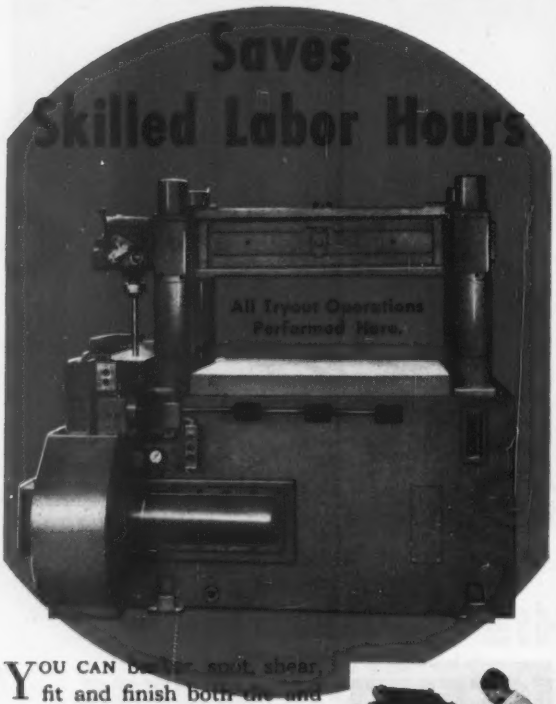
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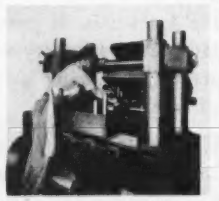
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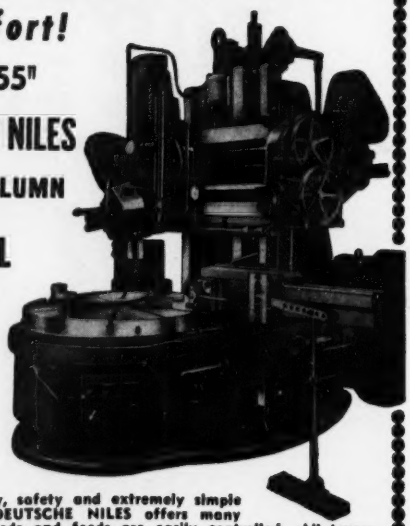
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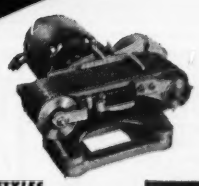


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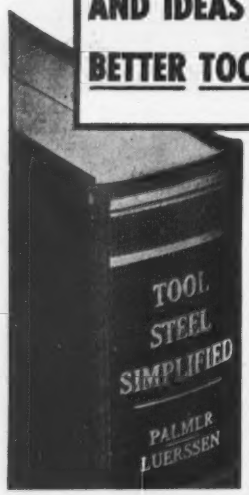
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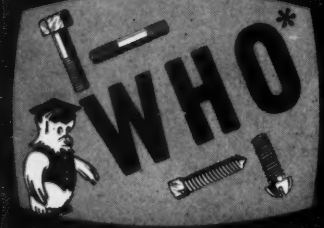
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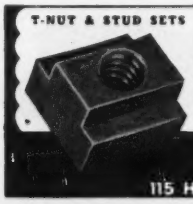
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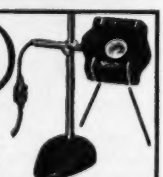
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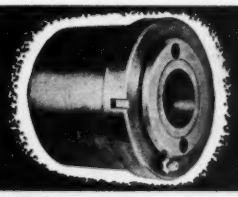


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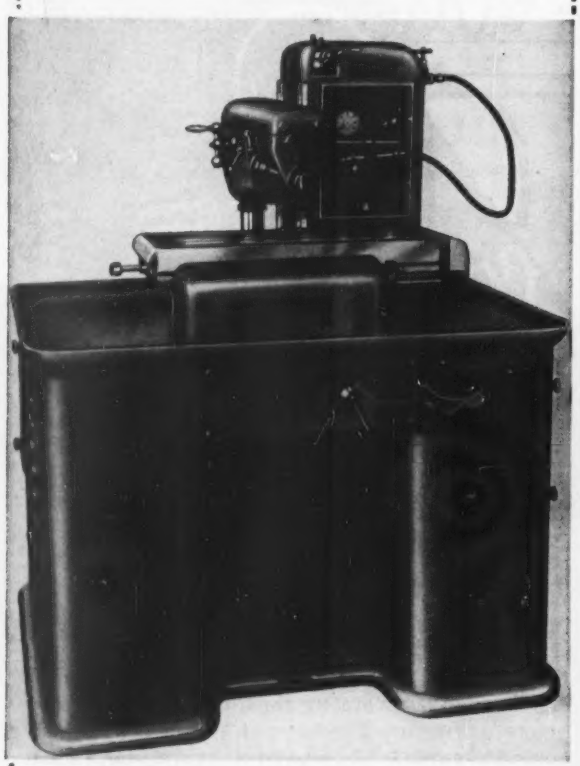


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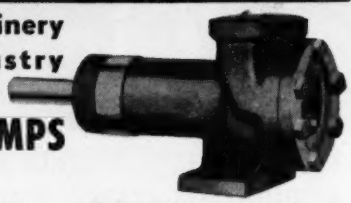


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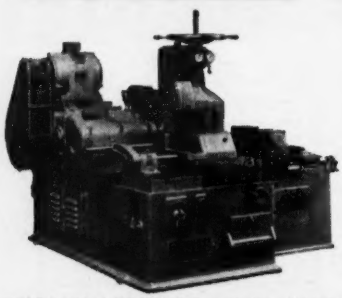
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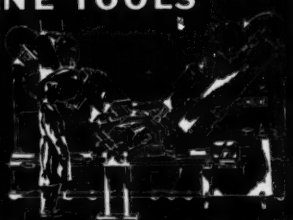
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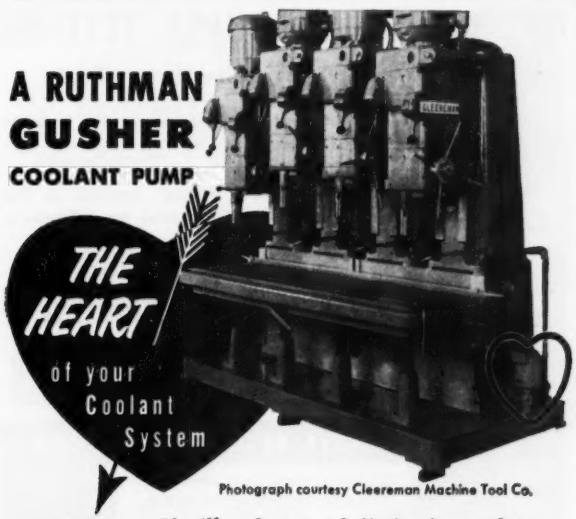
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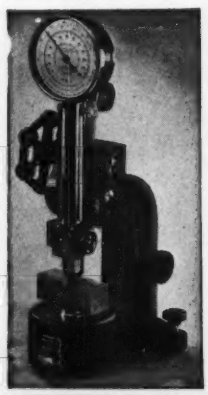
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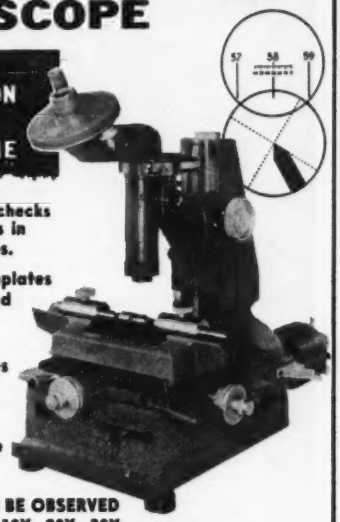
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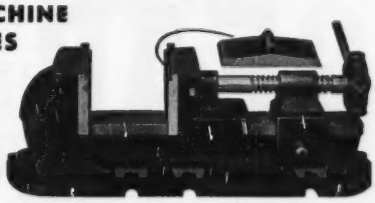
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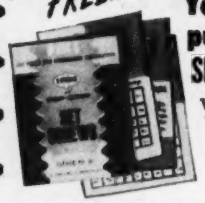
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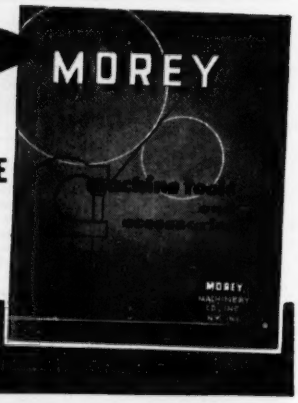
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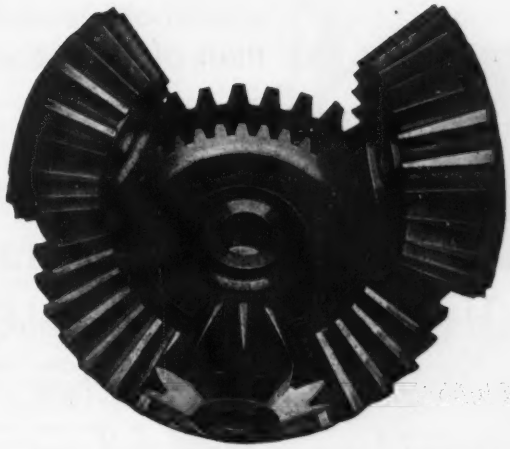
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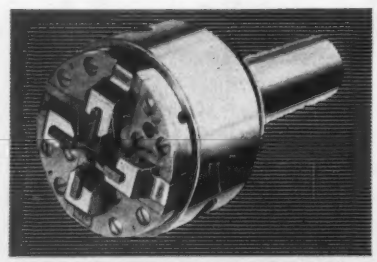
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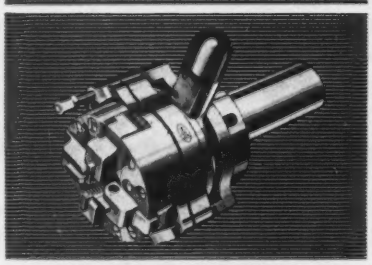


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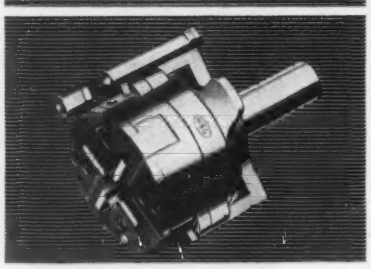
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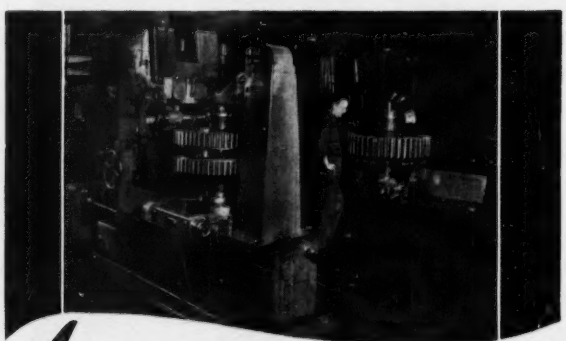
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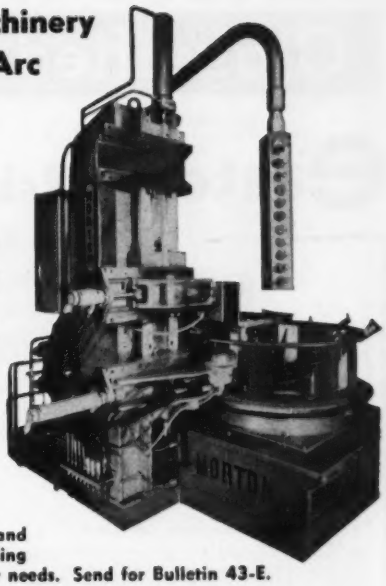
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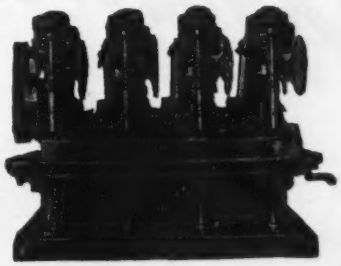
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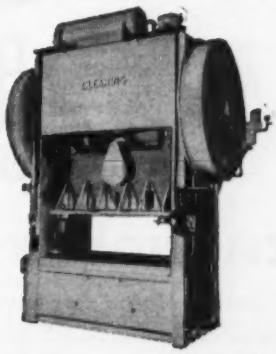
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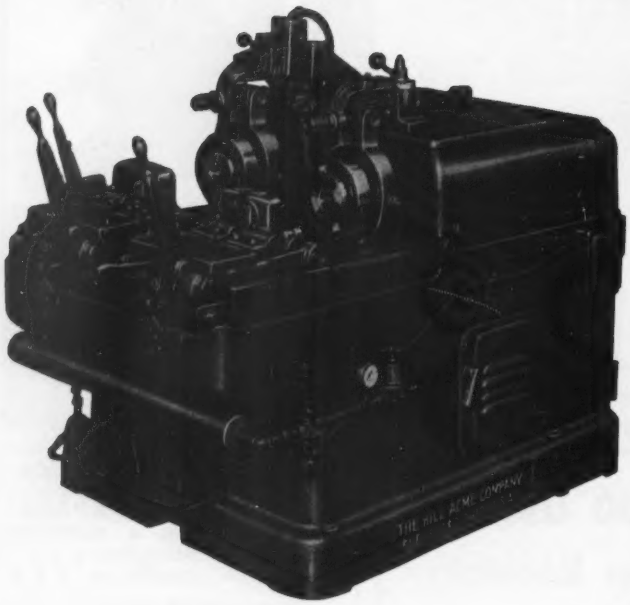
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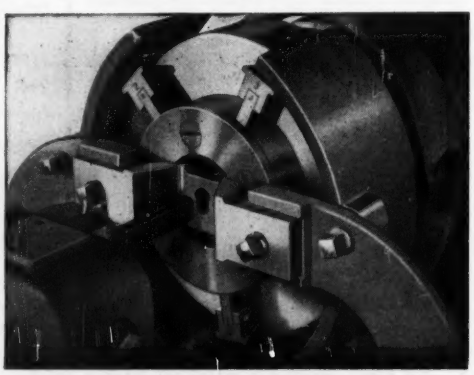
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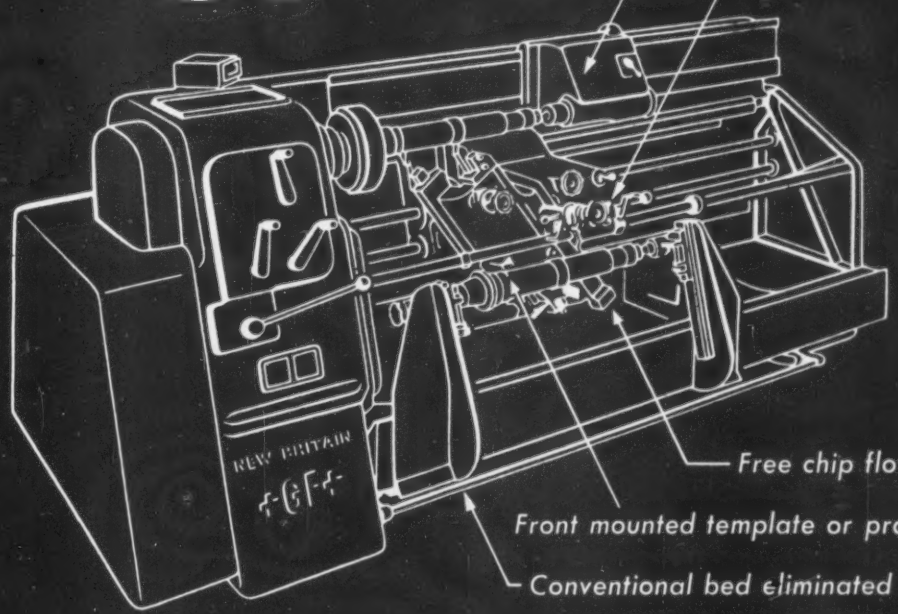
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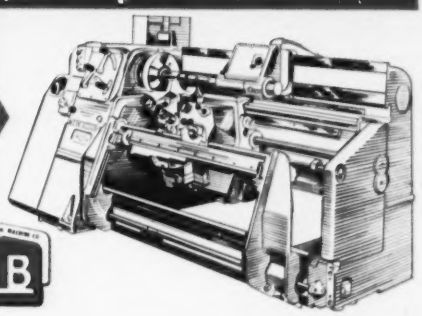


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Does more work in less time for less money, with less operator fatigue.

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NB

4-A lathe gets A-1 precision with TIMKEN® bearings

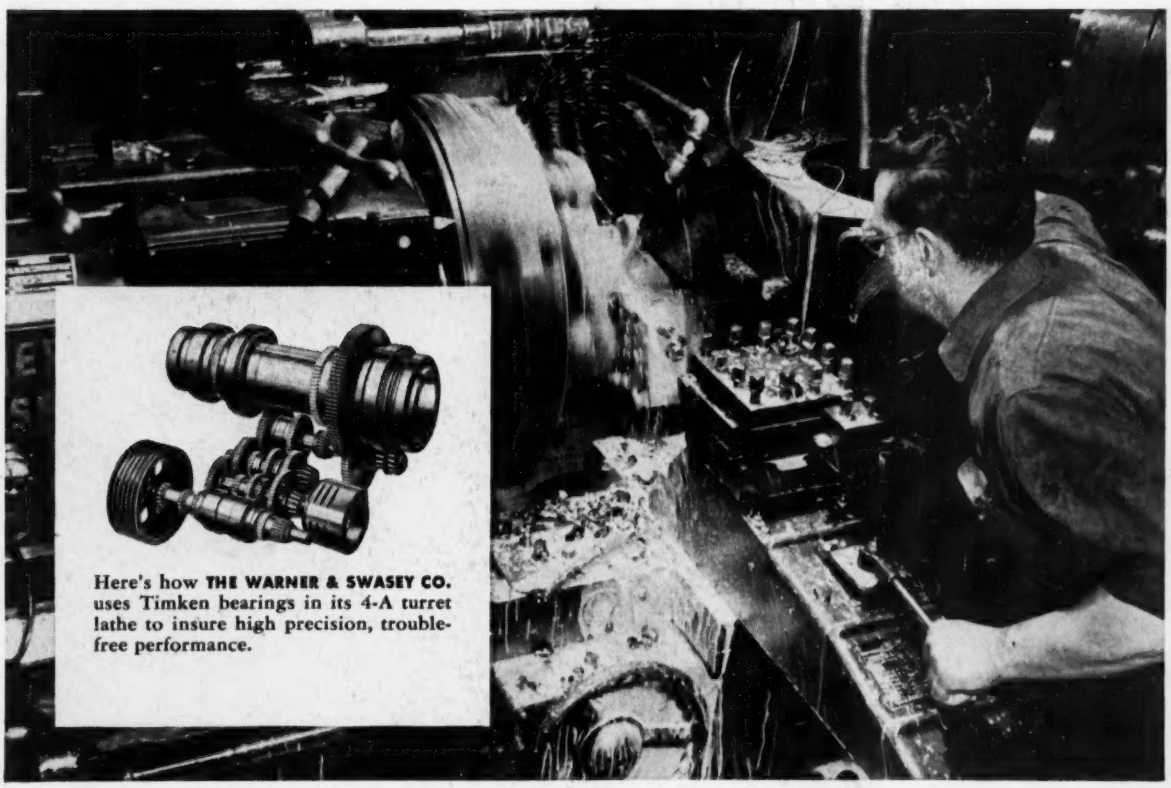
THIS Warner & Swasey 4-A turret lathe hogs off tough metal in a hurry, yet provides the high precision demanded for today's close-tolerance parts. Warner & Swasey engineers assure both precision and ruggedness by mounting the spindle and 12-speed gear train on Timken® tapered roller bearings.

Whether you're using a one-inch drill or making a 28″ turning cut, Timken bearings maintain spindle precision and accurate gear mesh day in and day out. They are tapered in construction to take radial, thrust and combination loads. Line contact between rollers and races provides maximum capacity. Shafts are held in rigid alignment. Gear mesh is smoother, more accurate. Shaft wear is eliminated, gear wear reduced.

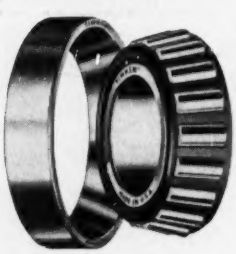
True rolling motion and an incredibly smooth surface finish combine to make Timken bearings practically friction-free. They're made from Timken fine alloy steel—finest steel ever developed for tapered roller bearings—and rollers and races are case-hardened for hard, wear-resistant surfaces and tough, shock-resistant cores.

No other bearing can offer you all the advantages of Timken bearings. Be sure to use them on the machine tools you build or buy. And look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED — *This symbol on a product means its bearings are the best.*



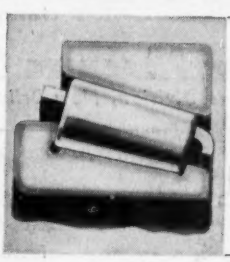
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TAPERED ROLLER BEARINGS



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